# REMEDIAL INVESTIGATION REPORT
# FORMER GE COURT STREET BUILDING 5/5A SITE
# NYSDEC SITE NO. 734070
# TOWN OF DEWITT, ONONDAGA COUNTY, NEW YORK

Prepared for

Lockheed Martin Corporation
Syracuse, New York

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**Remedial Investigation Report**
**Former GE Court Street Building 5/5A Site**
**NYSDEC Site No. 734070**
**Town of Dewitt, Onondaga County, New York**

The material and data in this report were prepared under the supervision and direction of the undersigned. All activities described herein were performed in accordance with the New York State Department of Environmental Conservation-approved Remedial Investigation/Feasibility Study Work Plan (August 1997, revised January 1997).

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# 1 INTRODUCTION

This document presents the methods, findings and conclusions of the Remedial Investigation (RI) performed at the Former General Electric (GE) Court Street Building 5/5A site located in the Town of Dewitt, Onondaga County, New York. The RI was performed in accordance with a New York State Department of Environmental Conservation (NYSDEC) approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan prepared for the site by Blasland, Bouck & Lee, Inc. (August 1997, revised January 1997), on behalf of Lockheed Martin Corporation (LMC). The RI was completed in accordance with Section III of the June 11, 1996 Order on Consent (Index No. D7-0001-96-05) between NYSDEC and LMC. The site is currently classified as a Class 3 site on the New York State Registry of Inactive Hazardous Waste Disposal Sites (No. 734070). The Class 3 designation is assigned to sites that do not present a significant threat to the public health or environment.

The RI was implemented to supplement site data obtained during previous investigations. Site data from the RI and previous investigations will be used to support the Interim Remedial Measures (IRM) program, and the subsequent Feasibility Study (FS). Both RI and IRM activities are described herein.

## 1.1 Site Location and Description

The Former GE Court Street Building 5/5A site ("site") is located at the intersection of Deere Road and Route 298 in the Town of Dewitt, Onondaga County, New York. The site location and site features are shown on Figure 1 and Drawing 1.

The Former GE Court Street Building 5/5A site consists of approximately 14.1 acres. Building 5 occupies approximately 256,000 square feet, and Building 5A occupies approximately 83,200 square feet. The remainder of the site is paved with only small landscaped areas present adjacent to the buildings. The site is bordered on the north by property owned by Ronald G. Gustafson, Sanders Creek and Route 298, on the east by Deere Road, on the south by property owned by Dennis and Pauline Fehr, and on the west by property owned by Onondaga County, and the South Branch of Ley Creek.

## 1.2 Site Background

This Section provides information regarding parties that have an interest in current site activities, a summary of historical operations and previous environmental investigations at the site, and an overview of recent activities which have been conducted at the Building 5 property by the current owner.

### 1.2.1 Introduction of Parties

The following is a list of parties that have an interest in current site activities related to this RI:

- DE & JD Associates, Inc. — Current owner of Building 5 property;
- G & A Properties — Current owner of Building 5A property;
- Lockheed Martin Corporation — Responsible for remedial activities at the Former GE Court Street Building 5/5A Site; and
- Onondaga County — Owner of property west of the site (i.e., between the site and the South Branch of Ley Creek).

The following is a list of parties that participated in conducting the RI:

- EMCON — completed RI field activities and developed RI report.
- Parratt-Wolff, Inc. — performed RI drilling services under supervision of EMCON.
- Columbia Analytical Services, Inc. — performed analytical laboratory services related to RI samples.
- Environmental Quality Associates, Inc. — provided third party data validation of RI sample results.
- Modi Engineering and Land Surveying, Inc. — completed survey of RI sample locations.

### 1.2.2 Operational History

Building 5 was constructed in 1956, and was leased to GE by several owners until 1993. Building 5A was leased to the Continental Can Company until 1958, after which it was leased to GE. The last owner to lease the Building 5 and Building 5A properties to GE was DE & JD Associates, Inc. (DE & JD) after it acquired title to these properties in 1988. GE used Building 5 primarily for the manufacture of sonar and radar equipment, printed circuit boards, and power packs. The building also housed laboratories and offices. GE used Building 5A to warehouse production equipment and raw materials, and as an auxiliary radar and sonar testing and repair shop.

Although GE operations in both Buildings 5 and 5A had ceased by December 31, 1991, GE continued to lease these properties until April 2, 1993, when GE assigned the leases to Martin Marietta Corporation (MMC) in connection with the transfer of GE's Aerospace business. MMC leased the buildings from April 2, 1993 to December 30, 1993, but, during this period, MMC did not conduct any operations at the site other than remedial activities. On December 30, 1993, MMC terminated the leases on the Building 5 and Building 5A properties. At that time, DE & JD granted to MMC a permanent access easement to ensure MMC's continued access to the site to perform remedial activities. On January 28, 1995, MMC merged with its parent corporation, LMC. LMC is the successor by merger to MMC. Presently, LMC continues to conduct remedial activities at the site.

After GE ceased its operations in December 1991, Building 5 remained vacant until recently when DE & JD undertook renovations and leased the building to Climax Manufacturing Corporation (a trucking and warehouse company). Building 5A, and the property between Building 5 and Building 5A, is currently owned by G&A Properties. G&A Properties leases space to W.J.W. Associates, Raymond Corporation and C&S Technical Services (metal garage, at the southwest corner of Building 5).

Nine, 250-gallon underground storage tanks (USTs) formerly located on the west side of Building 5 provided storage of virgin solvents and thinners used in GE's manufacturing operations. All nine tanks were taken out of service in 1960, although they were not removed from the ground until 1986. Liquids stored in the tanks were dispensed above ground and transported inside the building for use. Following the closure and removal of the USTs, the solvent storage pad (formerly located on the west side of Building 5) was used for dispensing of virgin solvents and thinners used in GE's manufacturing operations. Dispensing of solvents from the solvent storage pad was performed above ground and solvents were piped through the wall and dispensed inside the building for use.

As a component of the power distribution system at the site, electrical transformers were installed inside and outside Buildings 5 and 5A. These transformers were manufactured with polychlorinated biphenyl (PCB)-containing oils. GE removed and/or replaced all but two of the transformers in 1989 and 1990. The two transformers not replaced were located north of Building 5. Transformers were replaced with dry, non-PCB-containing units. Analysis of the transformers not replaced indicated that oil within the transformers contained PCBs at concentrations less than 500 parts per million (ppm).

### 1.2.3 Previous Investigations

In 1991, GE initiated an assessment of the site in anticipation of the termination of the lease agreement for the facility buildings. The purpose of this assessment was to identify potential environmental impacts related to historic GE operations. Among the findings of this assessment were the identification of the former location of nine USTs, the solvent storage pad, and the former and present location of transformers at Buildings 5 and 5A. Based on these findings, a subsurface investigation was completed.

Subsurface investigations performed in 1992 indicated that volatile organic compound (VOC)-impacted soil and groundwater were present at the site. This investigation indicated the primary source area was located along the western property boundary adjacent to Building 5. Specifically, three locations were cited as contributing to the VOC impacts. These areas included the location of the former USTs, the former solvent storage pad, and an area adjacent to a former metal shed located on the south side of Building 5. The investigation concluded that groundwater impacts were primarily limited to the shallow groundwater. In addition, the investigation showed that VOC-impacted groundwater had migrated off-site in a westerly direction to property owned by Onondaga County where the County maintains a 48-inch diameter sanitary sewer line.

In an effort to control the source of VOCs, subsequent IRMs were undertaken in 1992. The IRM for the VOC-impacted soils included the removal of soils in the vicinity of the former USTs, solvent storage pad, and former metal shed locations. In addition, groundwater that accumulated in the excavations was also removed from the site. This IRM work consisted of soil removal to depths below the shallow groundwater table followed by confirmatory sampling for VOCs. The confirmatory sampling indicated that the majority of the VOC-impacted soil was removed in the former UST area and solvent storage pad area, while complete VOC removal was accomplished adjacent to the former metal shed. Only trace level residual VOCs remained in the solvent storage pad area and the unsaturated zone of the UST area. Higher residual levels of VOCs remained below the water table in the former UST area.

In an effort to control potential off-site transport of VOC-impacted groundwater, IRM activities were also performed in 1992 on the storm sewer systems which discharged to both the South Branch of Ley Creek and Sanders Creek. The purpose of this IRM activity was to modify the storm sewer system to prevent the infiltration of VOC-impacted groundwater into the catch basins and clay tile piping. Modifications performed included the abandonment, relocation, and reconstruction of two catch basins, grouting of select clay pipe sections, replacement of select sections of clay tile pipe, and grouting of pipe joints.

A Remedial Action Plan was developed in 1993 (Wehran-New York, Inc., March 1993), based on the results of the previous investigations. The Remedial Action Plan alternative selected for the site was to collect and treat VOC-impacted groundwater in an effort to mitigate the off-site migration of VOCs in groundwater. This Remedial Action Plan , in combination with the previous source area soil removals, was proposed to reduce the volume of constituents in the site soil and groundwater, and control the areal migration of impacted groundwater.

As described in the Remedial Action Plan Addendum (Wehran-New York, Inc., October 1993), additional storm sewer IRM activities were performed in 1993. The purpose of this work was to eliminate groundwater infiltration in a section of storm sewer which had not been rehabilitated during the previous storm sewer IRM work. Similar to the previous work, catch basins and clay tile pipe were removed and replaced.

The final remedial action (RA) alternative for site groundwater was selected and presented in the 1993 Remedial Action Plan Addendum, and included the installation of a collection trench to be constructed parallel to the northern and western boundaries of the site. Groundwater collected in the trench would be treated on-site and discharged to the South Branch of Ley Creek. The length of the collection trench was defined by the location of upgradient source areas (i.e., the former UST area and solvent storage pad), and the direction of groundwater flow. The vertical alignment of the trench was defined by the vertical distribution of VOC-impacted media and the location of discontinuous sand lenses located in the shallow subsurface.

In March 1995, in response to a request by DE & JD (the property owner), MMC removed soil in the area of the former transformer pad located adjacent to Building 5A. The soil was removed based on analytical data from a composite soil sample, collected by a consultant retained by a prospective buyer of the property, near a drain outlet from the transformer pad that reportedly contained 27.4 ppm PCBs. As part of the soil removal project, MMC collected three confirmatory soil samples from the excavation and one sample from soil removed and stockpiled in a roll-off container. The confirmatory soil sample analytical laboratory report was provided to NYSDEC in the attachment to an October 27, 1995 letter. No PCBs were detected (less than 1 ppm per Aroclor and total PCBs) in the three confirmatory soil samples. These data were not reviewed by a third party data validator. The soil was removed and disposed of off-site as non-regulated waste.

### 1.2.4 Site Owner Activities

DE & JD has recently undertaken renovation activities at Building 5. These activities included both interior and exterior renovation, as briefly discussed below.

Based on observation of renovation activities and review of DE & JD drawings, identifying proposed site modifications, the interior renovation of Building 5 included select demolition, build out and painting. Exterior renovations at Building 5 included demolition of the 400,000-gallon steel water tank and pump house, the cooling tower and the transformer pad formerly located north of Building 5. Waste material handling practices have been the subject of numerous correspondence among LMC, NYSDEC, and DE & JD during this renovation period.

As discussed below (Section 1.3), the transformer pad formerly located north of Building 5, demolished by DE & JD, is the subject of a specific objective of the RI. LMC has requested information regarding the demolition of this transformer pad (including analytical data) from DE & JD, but it has not been received.

## 1.3 Remedial Investigation Objectives

The overall objective of the RI is to provide data to supplement site information obtained during previous investigations in support of the IRM program and the FS. All information will be used to fully assess current site conditions and evaluate the IRMs for the site. Based on this general objective, the following specific objectives were established as part of the NYSDEC-approved RI/FS Work Plan for the RI:

1. Define the vertical extent of VOCs in the former UST and solvent storage pad areas;
2. Define the vertical and horizontal extent of groundwater impacted by VOCs;
3. Assess the potential presence of PCBs in the soil adjacent to the existing transformer pad on the north side of Building 5;
4. Evaluate the potential influence of the 48-inch diameter sanitary sewer line located on adjacent County property on the groundwater flow patterns west of Building 5 at the site;
5. Assess the results of storm sewer rehabilitation IRMs by determining the presence or absence of infiltration of VOCs in stormwater discharges at the outfalls in Sanders Creek and in the South Branch of Ley Creek;
6. Define whether the migration of VOC-containing groundwater at the site has impacted surface water quality in the South Branch of Ley Creek;
7. Assess the potential presence of VOCs in the sediment near two storm sewer outfalls;
8. Provide data necessary to evaluate the proposed IRM for groundwater remediation; and
9. Provide data necessary for the preparation of a FS to evaluate potential final remedial alternatives for the site. In this regard, the IRM (i.e., the groundwater

collection and treatment system described in Section 4.3) is intended to be the final remedy for site groundwater.

# 2 METHODOLOGIES

This section includes a description of the field activities and methods used in the physical and chemical characterization of the site performed as part of this RI. Field activities included the drilling of soil borings, the installation of piezometers and groundwater monitoring wells, and the sampling and analysis of soil, groundwater, surface water and sediment. The field activities were completed between February 1997 and June 1997. Drawing 1 shows the test locations associated with the investigation together with pre-existing installations that provide the basis for characterizing the site. A discussion of the field activities is provided below.

## 2.1 Soil Investigation

The soil investigation activities described below were completed to achieve the following objectives of the NYSDEC-approved RI/FS Work Plan:

1. Define the vertical extent of VOCs in the former UST and solvent storage pad areas; and

2. Assess the potential presence of PCBs in the soil adjacent to the transformer pad on the north side of Building 5.

### 2.1.1 Deep Soil Borings

Deep soil borings were performed on February 10 and 11, 1997 in the area of the former solvent storage pad (SB-50) and the area of the former USTs (SB-49). Drilling was performed by Parratt-Wolff of Syracuse, New York, under the observation of an EMCON geologist. The borings were advanced utilizing 4¼ -inch inside diameter hollow-stem augers, mounted on a CME-75 truck rig. Since shallow residual VOCs in these areas had been adequately characterized during previous investigations, the RI investigative activities were limited to an evaluation of the vertical extent of VOCs.

Continuous soil samples were taken from the unconsolidated deposits utilizing a 2-foot split-spoon sampler, in accordance with ASTM D1586. Upon removal from the borehole, the split-spoon was opened and screened with a photoionization detector (PID) equipped with an 11.7 electron volt lamp, for detecting the presence of VOCs. The soil was also visually classified according to a system modified after Burmister. A representative portion of the soil was placed in a laboratory sample container if analysis was anticipated, while the remaining fraction was placed in a driller's glass soil jar, then covered with a sheet of aluminum foil for subsequent head space analysis. Headspace analysis was performed using a PID, approximately 1 hour after sample collection.

The initial field screening (immediately upon opening of spoon) and the jar head space values were recorded, and are referenced in the remarks column of the geologic boring logs included in Appendix A.

In accordance with the NYSDEC-approved RI/FS Work Plan, the sample interval with the highest headspace reading from SB-49 (18- to 20-foot depth beneath the ground surface at the former UST area), and the sample interval immediately beneath the backfill at SB-50 (4- to 6-foot depth beneath the ground surface at the former solvent storage pad) were analyzed for target compound list (TCL) VOCs, and semi-volatile organic compounds (SVOCs) by Analytical Services Protocol (ASP) Methods 95-1 and 95-2, respectively. In addition, the sample interval from SB-49 which appeared to represent the vertical extent of VOCs (the 22- to 24-foot depth interval) was analyzed for TCL VOCs by ASP Method 95-1. Quality Control (QC) samples were collected by EMCON, in accordance with the NYSDEC-approved RI/FS Work Plan, for QC by a third party validator (Environmental Quality Associates, Inc.).

Upon completion of each test boring, the borehole was sealed from its bottom to the surface with a cement bentonite grout mixture, utilizing the tremie rod method.

Throughout the drilling program, all downhole tools were steam cleaned between boring locations. All decontamination water was pumped from the decontamination area to a 55-gallon drum, which was labeled, sealed, and placed in the drum storage building on site. All excess soil cuttings were collected and placed in 55-gallon drums, labeled, sealed, and placed in the drum storage building on site. In accordance with Section 4.4 of the Sampling and Analysis Plan (RI/FS Work Plan, BB&L, January 1997), all investigation-derived wastes were characterized and disposed of off-site by Laidlaw Environmental Services, Inc.

### 2.1.2 Transformer Pad

To assess the potential presence of PCBs in the soil adjacent to the existing transformer pad on the north side of Building 5, 3 shallow hand auger borings (SB-51, SB-52, and SB-53) were performed on February 10, 1997 by EMCON field personnel. SB-51 was installed to the west of the concrete pad and SB-53 was installed to the east of the concrete pad, using a hand-operated, stainless steel bucket auger. SB-52 was installed through the concrete pad to the north of the transformers and was advanced through

4 inches of concrete utilizing an electric rotary corer prior to sample retrieval with the bucket auger.

Samples for laboratory analysis were collected from the first 6 inches of soil encountered beneath a surficial gravel layer at these locations. Soil was removed from the bucket auger with a stainless steel spoon, and placed into a stainless steel tray, to composite the soils for a representative sample. Depths were measured and soil descriptions recorded, and the soil placed in laboratory glass jars for shipment to the laboratory for analysis.

Upon completion of the shallow test borings, the unused soil cuttings were placed back in the borehole and the borehole was grouted to the surface with concrete. Sample locations are identified on Drawing 1.

All three samples were analyzed for PCBs by NYSDEC ASP Method 95-3, in accordance with the NYSDEC-approved RI/FS Work Plan. QC samples were collected by EMCON, in accordance with the NYSDEC-approved RI/FS Work Plan, for QC by a third party data validator (Environmental Quality Associates, Inc.).

## 2.2 Groundwater Investigation

The groundwater investigation activities described below were completed to achieve the following objectives of the NYSDEC-approved RI/FS Work Plan:

1. Define the vertical and horizontal extent of groundwater impacted by VOCs;

2. Evaluate the potential influence of the 48-inch diameter sanitary sewer line located on adjacent Onondaga County property on the groundwater flow patterns west of the site; and

3. Provide data necessary to evaluate the groundwater collection and treatment system IRM.

### 2.2.1 Deep Monitoring Well MW-6D

A deep monitoring well (MW-6D) was installed downgradient of the former UST area adjacent to the existing shallow monitoring well MW-6S using a track-mounted Ingersol Rand A-300 drill rig. MW-6D was installed to monitor the deep sand unit downgradient of previously identified areas of VOC-impacted groundwater. The borehole for MW-6D was advanced using 8.75-inch inside diameter hollow-stem augers, and was continuously sampled in accordance with ASTM D1586. This created a minimum outside diameter borehole of 12 inches. Soil samples were screened with the PID as described in Section 2.1.1. At a depth of 20 feet, the auger plug was removed and the inside of the auger flights were filled with cement bentonite grout via the tremie rod method of placement. This was followed by the removal of the augers from the borehole.

After removal of the augers, a 10-inch diameter steel casing was advanced through the grout to a depth of 20 feet, then pressed 1 foot further (into undisturbed soils) to a depth of 21 feet, which was approximately 7 feet into the clay and silt unit. After setting the steel casing, the tremie rods were again placed back down the casing to a depth of 20 feet, and the excess grout within the casing was flushed out with potable water. The grout was then allowed to set for approximately 64 hours. Subsequently, the boring was advanced with 4¼-inch hollow-stem augers inside the 10-inch steel casing (taking continuous split-spoon samples) to the required depth. Upon completion of the boring, a 3-foot long, 2-inch diameter, schedule 40, flush-joint PVC screen and solid PVC riser pipe was installed. The annular space around the screen was filled with silica sand to a depth of 2 feet above the top of the screen, followed by a 3-foot bentonite seal and then a cement bentonite grout via the tremie method to the ground surface. This double-cased method of drilling minimized the potential for inducing the migration of VOC-impacted groundwater from the shallow soils to the deep sand unit.

The installation was completed with a locking protective steel casing and surface concrete pad. The geologic boring log for MW-6D is included in Appendix A. After 24 hours, MW-6D was developed by bailing and submersible pumping in accordance with the NYSDEC-approved RI/FS Work Plan and the procedures described in Section 2.2.6.

### 2.2.2 Monitoring Well Couplets

Three monitoring well couplets (MW-16A and MW-16B; MW-17A and MW-17B; MW-18A and MW-18B) were installed near existing monitoring wells MW-4S, MW-10, and MW-11, respectively. As shown in Table 1, the monitoring well couplets consisted of a shallow monitoring well (A series) screened at a depth interval from approximately 2 feet below the ground surface to approximately 10 feet below the ground surface, and a deeper well (B series) screened at a depth interval from approximately 12 to 21 feet below the ground surface. These wells were installed to evaluate the depth and alignment of the groundwater collection and treatment system IRM (described in Section 4.3). The shallow wells were designed to screen the interval to be intercepted by the collection trench, while the deeper wells were designed to screen the interval immediately beneath the collection trench.

Each of these wells were advanced using 4¼ -inch hollow-stem augers attached to the track-mounted drill rig. Continuous soil samples were obtained from each boring by driving the 2-foot long split-spoon sampler. Each soil sample was characterized for soil type, color, texture, grain size and moisture content, and was screened for the presence or absence of VOCs utilizing the PID. Upon reaching the target depths, a 2-inch diameter well screen and appropriate length riser, was installed. The annular space of the wells was filled with silica sand to a depth of 2 feet above the top of screen, followed by a 2-foot thick bentonite seal and cement bentonite grout.

The wells were completed at ground surface with a protective steel casing or flush-mount enclosure and concrete pad. The geologic boring logs for these wells are included in Appendix A. After 24 hours, each well was developed by bailing or submersible pumping in accordance with the NYSDEC-approved RI/FS Work Plan and the procedures described in Section 2.2.6.

### 2.2.3 Shallow Monitoring Well MW-19S

In order to help define the horizontal extent of groundwater impacted by VOCs in the northern portion of the site, shallow well MW-19S was installed on June 9, 1997. Drilling of this well was performed by Parratt-Wolff, utilizing 4¼-inch hollow-stem augers on a CME-75 truck rig. Continuous soil samples were obtained from each boring using a split-spoon sampler in accordance with ASTM D1586. Each soil sample was characterized for soil type, color, texture, grain size and moisture content, and was screened for the presence or absence of VOCs utilizing the PID.

The location of this well was designed to provide lithology of subsurface conditions at this portion of the site, as well as to provide a groundwater monitoring point for VOCs. Therefore, the boring was advanced to a depth of 16 feet below ground surface to determine the presence/absence of sand lenses. Subsequently, based on the absence of sand lenses, the lower interval of the boring was sealed with bentonite to isolate the well screen interval to the approximate intended interval of the groundwater collection and treatment system IRM collection trench (described in Section 4.3).

Upon completion of the boring, the bottom 5 feet was sealed with bentonite, and then a 2-inch PVC screen was installed within the silt and clay unit to intercept the water table. The annular space around the screen to a depth of 2 feet above the screen was filled with silica sand followed by a bentonite seal. The installation was completed with a concrete surface seal with a flush-mounted protective locking casing. The geologic boring log for MW-19S is included in Appendix A.

### 2.2.4 Replacement of Monitoring Well MW-11

During clearing activities for the construction of the groundwater collection and treatment system IRM, it was observed that MW-11 was damaged beyond repair. LMC proposed to abandon MW-11 and install a new replacement well (MW-11R) in a December 5, 1997 letter to NYSDEC. In accordance with NYSDEC's December 11, 1997 approval, MW-11 was abandoned and replaced with a new monitoring well designated as MW-11R.

Monitoring well MW-11 was abandoned in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures" (Malcolm Pirnie, Inc., Revised October 1996). Specifically, MW-11 was abandoned by puncturing the bottom of the PVC casing and grouting the boring using the casing as a tremie while removing the casing.

The replacement well, MW-11R, was installed approximately 5 feet upgradient (northeast) of the abandoned well. The borehole for MW-11R was advanced to the same approximate depth as MW-11 using 4¼-inch ID hollow-stem augers. Continuous split-spoon samples were obtained through the screen interval using a split-spoon sampler in accordance with ASTM D1586. Each soil sample was characterized for soil type, color, texture, grain size and moisture content, and was screened for the presence or absence of VOCs utilizing the PID. Following completion of the borehole, the well was constructed similar to MW-11 with a 5-foot section of 2-inch diameter 0.10 slot PVC screen and riser. The geologic boring log for MW-11R is included in Appendix A.

MW-11R was developed on January 20, 1998, in accordance with the requirements of the NYSDEC-approved RI/FS Work Plan and the procedures described in Section 2.2.6, and will be sampled in the future in place of MW-11.

### 2.2.5 Piezometers

To assess groundwater flow patterns along the Onondaga County operated 48-inch diameter sanitary sewer line, three sets of piezometers (PZ-T1, PZ-T2, and PZ-T3) were installed in a line perpendicular to the sanitary sewer line. The purpose of these piezometers was to obtain water level elevation data to compare to site-wide groundwater elevation data to evaluate the possible influence of the sanitary sewer line on groundwater flow.

At each transect location, 4 piezometers were installed (12 piezometers total), as follows:

- East - approximately 8 feet east of the sewer line;
- West - approximately 8 feet west of the sewer line;
- Edge - along the eastern edge of the sewer line; and
- Center - installed above the sewer line.

The boreholes for the piezometers were advanced using 4¼ -inch hollow-stem augers attached to a track-mounted drill rig. The boreholes were drilled to a depth of approximately 5 feet into the zone of saturation, with the exception of the "Center" piezometers whose depths were limited to the top of the sanitary sewer line. Borehole cuttings were observed and classified in the field with regard to texture and the presence of saturation. Following advancement of each borehole to the required depth, a 1¼-inch piezometer was installed consisting of a 5-foot section of PVC screen and appropriate length riser. A sand pack was placed around the screen interval to prevent clogging of the installation, and a bentonite seal was installed at the surface to prevent surface infiltration. Boring logs for the piezometers are included in Appendix A.

Following the acquisition of water level measurements, all of the piezometers were abandoned with the exception of the three "East" installations. The abandonment procedures were the same as those described for MW-11 (Section 2.2.4). The three remaining piezometers have been retained for hydraulic monitoring of the groundwater collection and treatment system IRM.

### 2.2.6 Monitoring Well and Piezometer Development

Development of the monitoring wells and piezometers was completed in accordance with the NYSDEC-approved RI/FS Work Plan to ensure the hydraulic connection with their formation materials which may have been disturbed or affected during drilling and well construction activities. Development for each of the wells was considered complete after evacuating a minimum of 3 well volumes and achieving turbidity values of less than 50 NTU and a stabilization of temperature, pH, and conductivity each to within a range of 10 percent, or evacuating the well up to a maximum of 10 well volumes.

Prior to development, the bottom of the well was measured to confirm the as-built construction, and a static water level measurement was obtained to calculate the total well volume. A clean Teflon bailer, equipped with a new piece of polypropylene retrieval rope, was used to remove any heavier sediments, if present, and to evacuate slower recovering wells. A low-flow rate submersible pump was used to develop the faster recovering wells.

### 2.2.7 Reinstallation of Staff Gauges

A total of 6 staff gauges were installed along Sanders Creek (SG-1, SG-2, and SG-3) and the South Branch of Ley Creek (SG-4, SG-5, and SG-6) during previous investigations. These gauges had subsequently been either damaged or removed during high flow events. Five of these staff gauges (SG-1 through SG-5) were reinstalled into the stream bed to provide surface water elevation data for the site. It was determined that SG-6 was not needed due to its proximity to SG-4, and therefore SG-6 was not reinstalled. Where possible, a spike was placed in a tree stump above the newly-installed gauge (at SG-1, SG-4, and SG-5) to act as a duplicate measurement point.

### 2.2.8 Sampling and Analysis

In accordance with the NYSDEC-approved RI/FS Work Plan, monitoring wells MW-1D, MW-2D, MW-3D, MW-5D, MW-6D, MW-3S, MW-7S, MW-8S, MW-12, MW-13, MW-14, MW-15, MW-16A, MW-16B, MW-17A, MW-17B, MW-18A, and MW-18B were sampled and analyzed for TCL VOCs by ASP Method 95-4 in March 1997. In addition, MW-17B and MW-19S were sampled and analyzed for TCL VOCs by ASP Method 95-4 in June 1997. Monitoring wells MW-7 and MW-12 were sampled and analyzed for TCL SVOCs by ASP Method 95-2 in March 1997. Monitoring wells MW-7, MW-10, MW-11, and MW-12 were sampled and analyzed for TAL Metals by ASP Inorganic Methods to evaluate the inorganic quality of the groundwater. QC samples were collected by EMCON and analyzed in accordance with the NYSDEC-approved RI/FS Work Plan for QC by a third party validator (Environmental Quality Associates, Inc.). Sample logs for the above referenced RI samples are included as Appendix B.

## 2.3 Surface Water/Storm Sewer Outfall Investigation

The surface water and storm sewer outfall investigation activities described below were completed to achieve the following objectives of the NYSDEC-approved RI/FS Work Plan:

1. Assess the results of storm sewer rehabilitation IRMs by determining the presence or absence of infiltration of VOCs in stormwater discharges at the outfalls in Sanders Creek and in the South Branch of Ley Creek;

2. Define whether the migration of VOC-containing groundwater at the site has impacted surface water quality in the South Branch of Ley Creek; and

3. Assess the potential presence of VOCs in the sediment near two storm sewer outfalls.

### 2.3.1 Surface Water Sampling

On March 13, 1997, two surface water samples were collected for VOC analysis in the South Branch of Ley Creek at locations SW-4 and SW-6. The surface water samples were collected by direct immersion of the sample containers into the stream.

### 2.3.2 Sediment Sampling

On March 13, 1997, one upstream and one downstream sample of fine-grained sediments from the top 6 inches of the stream bed were collected near OF-01 (Sanders Creek; currently OF-01A since being replaced as part of an IRM completed in August of 1997), and OF-02 (South Branch of Ley Creek). These samples were collected using a stainless steel Wildco hand corer with a Lexan insert. Samples were extruded into a stainless steel pan. Samples to be analyzed for VOCs were collected directly from the extruded core. Subsequently, remaining sediment from the downstream location at each outfall was homogenized for total organic carbon analysis.

Upstream sediment samples were collected approximately 10 to 15 feet upstream of each outfall. Downstream samples were collected approximately 10 to 15 feet downstream of each outfall.

### 2.3.3 Storm Sewer Outfall Sampling

On March 13, 1997, storm sewer outfall dry-weather discharge water samples were collected for VOC analysis from OF-01 (Sanders Creek; currently OF-01A since being replaced as part of an IRM completed in August of 1997), and OF-02 (South Branch of Ley Creek). These samples were collected by direct collection using sample containers placed into the outfall's discharge flow.

## 2.4 Survey

Following the completion of RI field activities, the new monitoring wells, transect piezometers, and staff gauges were surveyed for both horizontal and vertical control by Modi Engineering and Land Surveying of Syracuse, New York. These data were used to develop the base map for the site (Drawing 1). Vertical data was used to determine groundwater and surface water elevations.

## 2.5 NYSDEC Split Samples

During RI field activities at the site, NYSDEC collected split samples of subsurface soils, groundwater, sediment, storm sewer discharge water, and surface water at select sample locations. NYSDEC provided analytical data for these samples to LMC on April 25, 1997 and on July 3, 1997. Comparison of the results from NYSDEC split samples indicated that the data was consistent with data obtained by LMC. NYSDEC split sample analytical data did not undergo third party validation. Since the data sets were generally consistent, and NYSDEC data was not subjected to validation, Section 3 of this RI Report presents the sample results obtained by LMC.

# 3 RESULTS

Site geology and hydrogeology have been previously characterized at the site and are described in the 1993 Remedial Action Plan and 1993 Remedial Action Plan Addendum. These investigations identified the stratigraphic units and groundwater flow relationships across the site. The areal distribution of the VOCs in the groundwater regime was also described. The following sections summarize and update as applicable, site characteristics relative to site geology, site hydrogeology and the nature and extent of VOCs in soil, groundwater, surface water, and sediment.

## 3.1 Site Geology

The site geology has been characterized based on data obtained from a total of 89 test borings. These locations are shown on Drawing 1. Drawing 2 and Drawing 3 present geologic cross-sections depicting the subsurface stratigraphy relationships across the site. Geologic logs for each soil boring, monitoring well, and piezometer location are presented in Appendix A.

In descending order, subsurface stratigraphic units have been classified as follows: fill; clay and silt (which includes discontinuous interbedded sand/silt/peat layers); clayey silt; glacial sand; and a basal glacial till unit. The following discussion provides an overview of the units encountered.

### 3.1.1 Fill Deposits

Fill materials found at the site consisted of predominantly asphalt macadam and a coarse-grained sand and gravel subbase which had a typical combined thickness of 2 feet. Borings completed on the Onondaga County property encountered approximately 6 feet of reworked clay and silt soils. Fill materials (asphalt) and/or soils were encountered in 58 of the 89 test borings. During construction of the groundwater collection and treatment system IRM, a surficial layer of discarded china, approximately 1-2 feet thick was encountered in an area along the collection trench alignment in the vicinity of monitoring wells MW-10, MW-11, and MW-12.

### 3.1.2 Clay and Silt Deposits

This stratigraphic unit consists mainly of glaciolacustrine deposits of clay and silt with occasional partings of fine sand. The clay and silt deposits range in thickness across the site from approximately 15 to 20 feet and are characterized as quite plastic. Below a depth of 10 feet, these deposits are almost viscous and lack cohesive strength. Mottling, which is indicative of seasonal water level fluctuations (alternating oxidized and reduced conditions), was observed in the upper few feet of this unit. The clay and silt unit in certain areas of the site contains discontinuous lenses and thinly-bedded silts and fine sands, fine to medium sands, and isolated beds of peat soils.

### 3.1.3 Clayey Silt Deposits

The clayey silt unit consists mainly of silt with varying smaller percentages of clay. Fine sands can be typically found as partings, while the basal portion of the unit develops a higher percentage of fine sand at several locations. Geologically, the stratigraphic distinction was based on visual observations and field textural classification according to a system modified after Burmister.

### 3.1.4 Glacial Sand Unit

Underlying the clayey silts is a continuous deposit of fine to coarse glacial sands with smaller percentages of fine gravels and silts. Some stratification was evident as fine sands and silts at the upper portions of the unit graded to coarser sands with fine gravels towards the bottom. The sand unit encountered ranged in thickness from 4 to 10 feet.

### 3.1.5 Basal Glacial Till Unit

A dense layer of red-brown till was encountered beneath the sand layer. The till consists of an unsorted, unstratified mixture of silt and clays, sands and gravels, and appears to be continuous across the site. The thickness of the till is unknown since all of the deep borings were terminated within the upper portion of the unit.

## 3.2 Site Hydrogeology

Groundwater occurs within each of the stratigraphic units discussed above. However, this investigation focuses on the flow regimes where there is the potential for migration of VOCs. For this site, the upper clay and silt unit is important since it is known to have received VOCs from the former UST area and the former solvent storage pad area. In addition, the sand unit underlying the clayey silt deposit is of interest since it is potentially extensive and, relative to the silt and clay deposits, is more permeable and transmissive.

In order to define the direction of groundwater flow within these two units, water-level data were obtained from monitoring wells which were screened within each of the respective units. Table 1 summarizes monitoring well construction details. Table 2 summarizes the groundwater elevation data obtained during the RI field activities completed in March 1997, April 1997, and June 1997. These data were used to construct cross-sectional and plan view groundwater contour maps. Drawing 2 and Drawing 3 present cross-sections and a piezometric profile which depict the hydrologic relationships between the strata. Plan view maps are presented in Drawing 4, Drawing 4A, Drawing 5, and Drawing 5A for the shallow (clay and silt) and deep (sand) units, respectively.

### 3.2.1 Shallow Groundwater Flow System

The shallow groundwater flow system was characterized by the use of monitoring wells and piezometers screened at or just below the groundwater surface (MW-1S through MW-19S, and the sanitary sewer line transects PZ-T1, PZ-T2, and PZ-T3), in addition to staff gauges in Sanders Creek and the South Branch of Ley Creek which provided surface water elevation data. Depth to water varies with regional precipitation patterns and typically ranges from 1 to 3 feet below the ground surface. The groundwater elevation contour map constructed from elevation data obtained on June 16, 1997 (Drawing 4), depicts a northwesterly and semi-radial flow pattern with discharge toward the South Branch of Ley Creek (located to the west) and Sanders Creek (located to the north). These two surface water bodies serve as discharge boundaries for the shallow groundwater flow system. Horizontal hydraulic gradients ranged from about 0.01 ft/ft to 0.04 ft/ft across the site. Horizontal permeabilities encountered in the shallow system at the site range from $10^{-4}$ cm/sec down to $10^{-6}$ cm/sec.

Drawing 4A depicts the configuration of the shallow groundwater based on water level measurements obtained on April 23, 1997, which would be representative of spring conditions. Generally, the water table contours reflect a semi-radial flow pattern as described above. It is worthwhile to note that relative to the June 1997 groundwater contour configuration, the April 1997 conditions reflect a more pronounced northerly component of flow toward Sanders Creek. This could be attributable to the influence of seasonal water table fluctuations with the effect of higher groundwater elevations during the spring months inducing a more northerly flow component toward Sanders Creek. Alternatively, or in addition to seasonal effects, the differences between the April 1997 and June 1997 events could be a function of specific groundwater elevation control points north of Building 5 that were used to construct the groundwater contours. Groundwater elevation data from monitoring well MW-19S, installed on June 9, 1997, was used to construct the June 1997 groundwater contour map. This additional control point was not used in the construction of the April 1997 groundwater contour map.

As part of the RI, an evaluation was conducted to determine if the 48-inch diameter sanitary sewer line that traverses the Onondaga County property (parallel to the South Branch of Ley Creek), was acting as a preferential pathway for shallow groundwater flow. In order to characterize localized groundwater flow in relation to the sanitary sewer line, piezometers were installed as described in Section 2.2.5.

Drawing 1 and Figure 2 provide the location of the piezometer transects. Table 2 summarizes the groundwater elevation data from the transects. A cross-section through PZ-T3, representing the hydraulic relationship between the shallow groundwater and the sanitary sewer line (based on April 1997 groundwater elevation measurements) is provided in Figure 3. Boring logs for the piezometers are presented in Appendix A.

The results of this investigation indicate that the sanitary sewer line is not acting as a preferential pathway for groundwater flow. The boring logs indicate that the subsurface soils used for backfill for the sanitary sewer line installation are all silts and clays typical of the native deposits at the site. This conclusion is based on those piezometers that were installed above and immediately adjacent to the sanitary sewer line. Specifically, piezometers designated as "Edge" were drilled within inches of the sanitary sewer line. The subsurface materials were all characterized as silts and clays. There were no indications of higher permeability bedding materials, such as sands or gravels, that would suggest a preferential pathway.

Figure 3 depicts a cross-section along PZ-T3 showing groundwater elevations obtained on April 23, 1997. Included along this transect is the groundwater elevation data from MW-10. This cross-section was chosen since it represents the greatest head drop between the upgradient and downgradient locations. The downgradient piezometer at this transect (T3 West) is also the piezometer nearest to the topographic decline to the South Branch of Ley Creek. There is an approximate 6-foot drop in elevation over less than 10 feet horizontally between the western-most piezometer and the Creek. Based on this observation, it is evident that the head drop across this transect is not due to any hydraulic influence of the sanitary sewer line, but rather to topographical changes across the site, and the hydraulic control of the South Branch of Ley Creek.

The groundwater elevation data do not suggest preferential flow along the sanitary sewer line. The elevation data are consistent with the overall configuration of the surficial groundwater flow regime at the site (Drawing 4). The surficial groundwater regime is topographically controlled and there is no evidence of any convergence of flow in the vicinity of the sanitary sewer line that would indicate a preferential pathway.

### 3.2.2 Deep Groundwater Flow System

Drawing 5 shows the direction of groundwater movement for the deeper sand unit based on water level elevation data obtained on June 16, 1997 from the installations completed within this unit (MW-1D, MW-2D, MW-3D, MW-5D, MW-6D, and PZ-1). As previously characterized in the 1993 Remedial Action Plan and 1993 Remedial Action Plan Addendum, the sand unit is confined by the overlying low permeability clay and silt unit.

Examination of the deep groundwater elevation contours shown on Drawing 5, indicates that groundwater in the deep sand unit flows in a north-northwesterly direction. The hydraulic gradient, as determined using June 16, 1997 data, is approximately 0.001 ft/ft. The horizontal permeability encountered in the sand system at the site is in the $10^{-2}$ cm/sec to $10^{-3}$ cm/sec range.

Previous groundwater elevation data were evaluated for the deep groundwater system. Drawing 5A depicts groundwater contours based on groundwater levels obtained on April 23, 1997. The directional component of flow is similar to that depicted for the June 16, 1997 event (Drawing 5).

### 3.2.3 Vertical Head Differences

The potential for contamination to move from the shallow flow system to the deeper flow system can be characterized by examination of the vertical water level elevation difference between the two flow systems, or vertical head differences. Vertical head differences were evaluated by installing monitoring wells as couplets or triplets screened in the shallow, intermediate, and deep hydrostratigraphic systems, respectively. Table 3 summarizes vertical gradients based on water elevations recorded in March 1992 (high precipitation period) and August 1992 (low precipitation period), and also presents values for June of 1997 for these same locations and the new monitoring well couplets (MW-6S/D, MW-16A/B, MW-17A/B, and MW-18A/B). Drawing 3 depicts the vertical gradient and presents a piezometric profile (based on June 16, 1997 water level data) in a northerly to southerly direction.

The June 1997 results are consistent with the findings presented in the 1993 Remedial Action Plan and 1993 Remedial Action Plan Addendum. With minor exceptions, the prevailing vertical gradient between the deeper versus shallower groundwater is upward. In other words, there is a tendency for groundwater to flow from deeper to shallower strata. Some localized reversals (i.e., flow from shallow to deeper strata) have been observed, which are probably due to low recharge periods.

## 3.3 Nature and Extent of Contamination

The following sections present the analytical results obtained from the soil, groundwater, surface water, storm sewer discharge water, and sediment sampling performed in accordance with the NYSDEC-approved RI/FS Work Plan, and describe the nature and extent of the contamination found at the site. Drawing 1 shows the sampling locations for the different media. Appendix C contains the validated analytical laboratory reports from the RI samples (Columbia Analytical Services, Inc.), and Appendix D contains the results of third party data validation (Environmental Quality Associates, Inc.).

The RI included collecting samples from the following media:

- Soil;
- Groundwater;
- Surface Water;
- Sediment; and
- Storm Sewer Discharge Water.

A discussion of each of the media is presented below.

### 3.3.1 Soil

As indicated in Section 1.2.3, IRMs were implemented at the site to address soil contamination in 1992. These IRMs are also discussed in Section 4.1 These IRMs involved the excavation of VOC-impacted soils in the former UST area and the former solvent storage pad area on the west side of Building 5, and a former metal shed on the southwest side of Building 5. Solvents were initially dispensed from 9 USTs and later from 55-gallon drums staged on an exterior concrete pad (Drawing 1). The metal shed was used for storage of maintenance equipment.

The objective of the soil removal operations was to excavate the majority of contaminated soils from the unsaturated zone and continue to remove soils from the upper saturated zone until groundwater conditions made excavation impractical.

Details of these remedial measures are found in the 1993 Remedial Action Plan. In summary, the IRM completed in 1992 was successful in removing the majority of VOC-contaminated soils from the site. Confirmatory sampling conducted following the removal of the contaminated soils indicated that only trace level residual VOCs remained in the solvent storage pad area, and in the unsaturated zone of the UST area. Higher residual VOC concentrations remained below the water table in the former UST area. Complete VOC removal was accomplished adjacent to the metal shed.

The objectives of the NYSDEC-approved RI/FS Work Plan with respect to soils, were as follows:

1. Define the vertical extent of VOCs in the former UST and solvent storage pad areas; and

2. Assess the potential presence of PCBs in the soil adjacent to the existing transformer pad on the north side of Building 5.

As part of the RI, soil samples were obtained in the area of the former solvent storage pad and in the area of the former USTs. This sampling was initiated from the bottom of the previous IRM excavations. All sampling was performed in the saturated zone. Soil samples, collected from within the former UST and solvent storage pad areas, were analyzed for VOCs and SVOCs. In addition, surficial and shallow subsurface soil samples were obtained at the transformer pad for analysis of PCBs. Table 4 summarizes the soil sample analytical data.

**Former Underground Storage Tank Area**

Soil samples were obtained, within the former UST area, at intervals of 18 to 20 feet below ground surface (BGS) and 22 to 24 feet BGS. These intervals are well within the saturated zone. The 18- to 20-foot interval represented the interval of soil exhibiting the highest level of organic vapors during field screening. The 22- to 24-foot interval represented the interval where a significant decrease in organic vapors was observed based on field screening. At the 18 to 20-foot interval, concentrations of VOCs were detected ranging from 1.1 ppm of 1,2-dichloroethane (1-2, DCA) to 280 ppm of trichloroethene (TCE). SVOCs detected were limited to trace levels of 2-methylphenol and 4-methylphenol at concentrations of 0.11 ppm and 0.16 ppm, respectively. Consistent with the much lower detection of organic vapors during field screening, concentrations of VOCs were more than an order of magnitude less at the 22 to 24 foot BGS interval, ranging from non-detect to 17 ppm for TCE. The extent of VOCs has been defined in the UST area.

**Former Solvent Storage Pad**

Analysis of the soil sample taken from beneath the backfill installed during the 1992 IRM indicated only trace levels of both VOCs and SVOCs. Most of the VOCs detected were found at estimated concentrations of less than 0.010 ppm. TCE and 1,1,1-trichloroethane (1,1,1-TCA) were detected at 0.019 ppm and 0.018 ppm, respectively. SVOCs detected were limited to trace levels (less than 0.25 ppm) of phthalates. The extent of VOCs has been defined in the former solvent storage pad area.

**Existing Transformer Pad**

Shallow hand auger borings were performed at the transformer pad on the north side of Building 5. In accordance with the NYSDEC-approved RI/FS Work Plan, these shallow soil samples (designated as SB-51, SB-52 and SB-53) were taken at worst case locations (i.e., at the immediate edge of the concrete pad, or beneath an expansion joint in the concrete pad). The samples were analyzed for PCBs. PCB Arochlor 1260 was detected at a concentration of 0.23 ppm in SB-52 (below the expansion joint in the concrete pad). No other PCBs were detected in these samples. Based on these results, no release of PCBs has occurred from these transformers which would require further action.

### 3.3.2 Groundwater

Twenty-eight groundwater monitoring wells have been installed across the site to characterize groundwater quality conditions in the shallow and deep groundwater. Previous site investigations have established that contamination was primarily limited to shallow groundwater, with the highest concentrations detected in the shallow wells installed in the vicinity of the former UST area and the former solvent storage pad area. Based on historical data and as discussed in the 1993 Remedial Action Plan, no evidence of non-aqueous phase liquid (NAPL) contamination was identified.

Overall, there has been no significant vertical migration of VOCs, relative to the high levels present in certain areas of the shallow system. The only apparent vertical migration was observed at the MW-1 triplet location. Based on sampling summarized in the 1993 Remedial Action Plan, the intermediate well (MW-1I) and deep sand well (MW-1D) showed relatively low levels of several constituents (1,1-DCA, 1,1-DCE, and 1,1,1-TCA) as compared to the shallow well (MW-1S). At the MW-2 triplet, no chlorinated VOCs were detected in MW-2I or MW-2D. No chlorinated VOCs were detected in MW-3D above New York State's Part 703 groundwater quality standards.

Characteristic groundwater contamination has previously been identified as chlorinated and aromatic VOCs. The most prevalent VOC detected in the groundwater is 1,1-DCA. Other site contaminants that have been detected historically include vinyl chloride, 1,1 dichloroethene (1,1-DCE), 1,1,1-TCA and the aromatics toluene, ethylbenzene, and xylenes.

The objective of the NYSDEC-approved RI/FS Work Plan with respect to groundwater was as follows:

1. Define the vertical and horizontal extent of groundwater impacted by VOCs.

Table 5 summarizes the groundwater analytical data for organics obtained from monitoring wells sampled during the RI. Sampling and analysis were conducted on selected shallow wells which monitor the surficial groundwater regime, and the deep wells which are screened in the deep sand unit.

VOCs were detected at trace concentrations in the deep sand well, MW-1D. The highest concentration detected was for 1,1-DCA at 22 ppb followed by 1,1,1-TCA at 6 ppb. The only VOC detected in any of the other deep wells sampled (MW-2D, MW-3D, MW-5D, and MW-6D) was 1,1-DCA in MW-6D (at an estimated concentration of 0.9 ppb, below the detection limit). Drawing 5 shows the configuration of the groundwater contours in the deep sand unit. Based on the groundwater contours, monitoring wells MW-2D and MW-6D, are hydraulically downgradient from MW-1D. As such, groundwater in the deep sand unit at MW-1D would be intercepted at MW-2D and MW-6D. These downgradient locations show no, or extremely trace (i.e., below contract-required quantitation limit) levels of VOCs. These levels comply with New York State's Part 703 groundwater standards. The upward gradients observed within the impacted areas (Drawing 3 and Table 3) are expected to minimize migration of VOCs into the deeper sand unit. The overlying clay and silt units exhibit very low vertical hydraulic conductivity ($k_v$) characteristics. As discussed in the 1993 Remedial Action Plan, $k_v$ values of $10^{-8}$ cm/sec to $10^{-9}$ cm/sec are characteristic of the overlying clays and silts. As presented in the March 1993 Remedial Action Plan, these samples contained primarily silts and clays (between 95.5 percent and 99.8 percent). If sandier materials were present in the samples, higher $k_v$ values would be expected. These $k_v$ values translate into very low vertical seepage velocities which would impede the vertical migration of VOC-impacted groundwater from the overlying units to the sand layer below.

Drawing 6 depicts the distribution of total VOCs in the shallow groundwater regime as detected in the shallow wells in March 1997. These shallow wells are screened to provide groundwater within about 10 feet of the ground surface. It should be noted that not all of the shallow wells were recently sampled. For example, MW-1S and MW-2S were not included in the scope of the RI because these installations are in close proximity to the former UST and solvent storage pad areas and have historically exhibited relatively high concentrations of VOCs.

As shown on Drawing 6, the areal extent of groundwater impacted by VOCs has been defined. For all practical purposes, there has been no significant migration of VOC-impacted groundwater beyond the Onondaga County sanitary sewer line which runs parallel to the South Branch of Ley Creek. MW-13 which is located downgradient of the sanitary sewer line, exhibited only trace levels of two VOCs (1,1-DCA and cis-1,2-DCE) at estimated concentrations of 2 ppb, and 0.8 ppb, respectively. Analytical results from MW-14 indicate that VOC-impacted groundwater has not migrated along a pathway beyond the South Branch of Ley Creek. The absence of VOC contamination at MW-14, which is on the western side of the South Branch of Ley Creek, is consistent with the groundwater flow characteristics as discussed in Section 3.2.1, which indicates that historically, the shallow groundwater regime in the area discharges toward the Creek.

While shallow monitoring wells near the former UST and solvent storage pad areas (MW-1S and MW-2S) were not sampled as part of the RI, historical groundwater quality data in these areas indicated the highest levels of VOCs nearest to the sources. The VOC isoconcentration map (Drawing 6) shows a rapid attenuation of contamination in downgradient flow directions. Attenuation with distance from the source areas is attributable to dilution via dispersive mechanisms and/or natural biodegradation. In addition, sorption to soils is likely to contribute to this attenuation. A review of the analytical database including the data presented in the 1993 Remedial Action Plan and 1993 Remedial Action Plan Addendum, indicates that chemical or biological degradation of the organic contamination may be taking place. This is based on the presence of chlorinated constituents other than 1,1-DCA, TCE and 1,1,1-TCA (i.e., the compounds that were believed to be used at the site) in the groundwater. Specifically, vinyl chloride has been detected in a number of shallow wells such as in MW-7S, MW-11, and MW-16A, that are in the downgradient flow direction from the former source areas. Chloroethane has also been detected in MW-11. These constituents are specific degradation products of 1,1-DCA, TCE, and 1,1,1-TCA. In addition, it is worthwhile to note that, whereas the aromatic hydrocarbons such as xylene and ethylbenzene were detected in the former source areas, these constituents are virtually absent in downgradient wells. This is additional supportive evidence that biodegradation is occurring since these substances are expected to biodegrade to carbon dioxide and water.

Table 6 summarizes the groundwater sample analytical data for metals obtained from monitoring wells sampled during the RI. Metals analyses were performed at selected monitoring wells for the purpose of characterizing treatment requirements for the groundwater collection and treatment system IRM. Metals have not been identified as constituents of concern at the site and no source areas have been identified that would result in metals impact to groundwater. Many of the metal constituents whose significant presence would suggest anthropogenic origin, including lead, mercury, and arsenic, were either not-detected or detected at trace concentrations. The metals that have been detected (e.g., aluminum, calcium, iron, magnesium, potassium, sodium, zinc, etc.) reflect ambient groundwater conditions reflective of the natural presence of these constituents in earth materials. The results of the metal analysis do not suggest any impacts related to site activities.

### 3.3.3 Surface Water

As part of the 1993 Remedial Action Plan Addendum, surface water samples were obtained from the South Branch of Ley Creek in areas immediately downgradient of the VOC-impacted groundwater zone as well as upstream and downstream of the site. These sampling locations (SW-1 through SW-7) are shown on Drawing 1. The purpose of the 1993 sampling was to determine if VOCs were present in the South Branch of Ley Creek as a result of groundwater discharge. The results of the analysis indicated the presence of trace levels (up to 5 ppb) of TCE both upstream and downstream of the site. However, because the distribution of TCE was fairly ubiquitous, it was concluded that there was no appreciable increase in TCE levels or concentration gradients in the TCE, and that detections may have been attributable to background levels or to artifact.

The objective of the NYSDEC-approved RI/FS Work Plan with respect to surface water was to:

1. Define whether the migration of VOC-containing groundwater at the site has impacted surface water quality in the South Branch of Ley Creek.

During the RI, surface water samples were obtained from the South Branch of Ley Creek, at two sampling stations established in 1993, to re-confirm that groundwater discharge to the Creek is not impacting surface water quality.

Table 7 summarizes the surface water analytical data obtained. The location of the surface water samples are shown on Drawing 1. As was previously identified, trace levels of VOCs were detected in the upstream (SW-6) and downstream (SW-4) surface water samples. Both the upstream and downstream samples exhibited comparable concentrations. It is noted that the upstream sample contained slightly higher concentrations of all detected VOCs. Based on the analytical data, it is evident that the groundwater discharges to the South Branch of Ley Creek are not impacting surface water quality, re-confirming the conclusions presented in the 1993 Remedial Action Plan Addendum.

An important fate and transport mechanism relative to VOCs in surface water is volatilization, which is the tendency for a compound to partition into the air phase from the water phase. For estimating releases from water to air, the Henry's Law constant is a good indication of volatilization potential. This constant represents the partition coefficient that expresses the ratio of the chemical concentrations between air and water at equilibrium. Organic compounds with Henry's Law constants in the range of $10^{-3}$ atmospheres-meter$^3$ per mole (atm-m$^3$/mole) and larger can be expected to volatilize readily from water; those values ranging between $10^{-3}$ to $10^{-5}$ atm-m$^3$/mole are associated with significant, but lesser volatilization, while compounds with values less than $10^{-5}$ atm-m$^3$/mole volatilize from water only to a limited extent (Lyman, et al., 1990). All of the VOCs detected in the surface water have a Henry's Law constant greater than $10^{-4}$ atm-m$^3$ /mole and are, therefore, expected to volatilize from surface water.

### 3.3.4 Sediment

The objective of the NYSDEC-approved RI/FS Work Plan with respect to sediment was to:

1. Assess the potential presence of VOCs in the sediment near two storm sewer outfalls.

Table 7 summarizes the results of the VOC analysis for sediment samples that were obtained upstream and downstream of the South Branch of Ley Creek and Sanders Creek outfalls. At the South Branch of Ley Creek outfall, all detected VOCs were at trace levels. For example, chloroethane was detected in the upstream sediment sample at a concentration of 11 ppb, while the downstream level was 21 ppb. Likewise, 1,1-DCA was detected at a concentration of 10 ppb and 22 ppb at the upstream and downstream locations, respectively. At the Sanders Creek outfall, trace levels (estimated concentrations, below detection limits) of VOCs were identified in both upstream and downstream samples.

There was no identifiable impact to sediment quality based on a comparison of upstream and downstream sediment samples at the Sanders Creek outfall. The sediment quality data at the South Branch of Ley Creek outfall do not suggest that the sediments in the South Branch of Ley Creek have been adversely impacted from the discharges from the outfall to the Creek. The reasons for this are as follows:

- The differences in the individual detected VOC concentrations between the sediment sample obtained upstream of the South Branch of Ley Creek outfall, and the sediment sample obtained downstream from the outfall were very minor (i.e., less than a factor of three). The individual VOC concentration differences between the upstream and downstream samples were only several parts per billion.

- There is no correlation between the quality of the dry weather discharges from the storm sewer outfalls and VOC concentrations in the sediments. VOC concentrations in the dry weather discharge from the storm sewer outfall were highest at Sanders Creek (i.e., higher than the VOC concentrations detected in the dry weather discharge in the storm sewer outfall into the South Branch of Ley Creek). Therefore, higher VOC concentrations would be anticipated in the sediment sample downstream of the Sanders Creek outfall if there were a correlation between the dry weather discharge and VOC concentrations in the sediments. However, no impact to sediment quality is indicated by the data at this location.

It is apparent from both the sediment and the surface water sampling results (Section 3.3.3) that there are upstream sources of VOCs in the South Branch of Ley Creek.

Downstream movement of the sediments would only take place via erosion and redeposition processes. Such processes would disperse the sediments resulting in even lower sediment VOC concentrations downstream. The VOCs detected in creek sediments in Sanders Creek and in the South Branch of Ley Creek represent negligible mass, with respect to any further downstream migration.

### 3.3.5 Storm Sewer Outfalls

The objective of the NYSDEC-approved RI/FS Work Plan with respect to storm sewer outfalls was to:

1. Assess the results of storm sewer rehabilitation IRMs by determining the presence or absence of infiltration of VOCs in stormwater discharges at the outfalls in Sanders Creek and in the South Branch of Ley Creek.

Samples of dry weather flow from storm sewer outfalls in Sanders Creek and the South Branch of Ley Creek were collected to assess results of storm sewer rehabilitation IRMs.

Table 7 summarizes the storm sewer outfall analytical data obtained. Analysis of the storm sewer outfall samples for the South Branch of Ley Creek (OF-02) and Sanders Creek (OF-01) indicate that there were minor contributions of VOCs from infiltration of groundwater to the storm sewer system. For the South Branch of Ley Creek outfall, several low-level VOCs were detected, with the highest concentration being 1,1-DCA at 29 ppb. This dry-weather flow is not expected to adversely impact the South Branch of Ley Creek. This is supported by the surface water results discussed in Section 3.3.3. Downstream surface water sample SW-4 (approximately 900 feet downstream of the outfall), did not exhibit VOC concentrations greater than those detected in the upstream sample location.

Somewhat higher VOC levels were detected in the Sanders Creek outfall (OF-01). Specifically, vinyl chloride, 1,1-DCA and cis-1,2-DCE were detected at estimated concentrations of 87 ppb, 140 ppb, and 42 ppb, respectively.

As discussed in Section 4 of this document, due to the results of the RI field activities, a storm sewer system IRM was completed in August 1997. This IRM has further minimized VOC-impacted groundwater infiltration to the South Branch of Ley Creek storm sewer system, and eliminated all groundwater infiltration to the Sanders Creek storm sewer system.

# 4 INTERIM REMEDIAL MEASURES (IRM)

This Section of the RI report provides a summary of IRMs conducted at the site prior to commencement of RI field activities, as well as IRM activities conducted based on the results of the RI sample analyses (i.e., additional storm sewer rehabilitation) and the groundwater collection and treatment system IRM.

## 4.1 Previous IRMs

Previous use of the site by GE included the storage of solvents in nine USTs, and a solvent storage pad for dispensing of virgin paint solvents and thinners. Subsurface investigations performed in 1992 indicated that VOC-impacted soil and groundwater were present at the site, primarily along the western site boundary, adjacent to Building 5. Three source areas were identified including the former USTs, the solvent storage pad, and an area adjacent to a former metal shed at the southwest corner of Building 5. In 1992, IRMs were completed to remove VOC-impacted soils from these areas. Groundwater which accumulated in the excavations was also removed from the site.

Confirmatory sampling indicated that the majority of VOC-impacted soils in the former UST area and the former solvent storage pad area were removed, and that complete VOC removal was performed adjacent to the former metal shed. A Remedial Action Plan was prepared in 1993, which recommended collection and treatment of groundwater to prevent migration of residual VOCs in groundwater towards the South Branch of Ley Creek. The 1993 Remedial Action Plan was proposed to control the areal migration of impacted groundwater.

During the process of evaluating the migration pathways for VOC-impacted groundwater, it was recognized and confirmed that certain site storm sewers were acting as a preferential pathway for migration of VOC-impacted groundwater. The original storm sewer system at the site consisted of bell and spigot clay tile piping with brick catch basins. This type of construction typically allows infiltration of groundwater into the piping and catch basins. In 1992 and 1993, IRM activities (detailed in the 1993 Remedial Action Plan and the 1993 Remedial Action Plan Addendum) related to the storm sewer system were completed to prevent the infiltration of groundwater from VOC-impacted areas into the storm sewers. These activities included abandonment and relocation of catch basins, grouting of existing sections of clay tile piping, and installation of new storm sewer piping. Post-IRM sampling of the outfalls confirmed that the IRMs were successful in mitigating the infiltration of VOCs to the storm sewer system at that time.

## 4.2 Additional Storm Sewer Rehabilitation

Subsequent storm sewer outfall sampling (performed in March 1997 as part of this RI) indicated that low-level VOCs were present in the Sanders Creek and the South Branch of Ley Creek storm sewer outfalls. This information was utilized to develop the Storm Sewer IRM Work Plan (EMCON, June 1997), which was approved by the NYSDEC. The Engineering Certification Report for the IRM (EMCON, November 1997) details the construction work completed and the results of the first round of post-construction sampling.

### 4.2.1 Sanders Creek Outfall (OF-01)

Laboratory data from the March 1997 sampling indicated that a total of 269 ppb of VOCs were detected at the Sanders Creek outfall. The compounds detected in the OF-01 outfall sample (vinyl chloride, 1,1-DCA, and 1,2-DCE) were also detected in MW-16A. MW-16A is located adjacent to the storm sewer line between catch basins CB-3 and CB-4. This segment of storm sewer was not replaced during IRMs conducted at the site in 1992 and 1993. The construction of this segment of storm sewer was bell and spigot clay tile pipe which allowed infiltration of groundwater into the storm sewer system.

To address discharges to Sanders Creek, LMC completed the following IRM activities in August 1997:

1. Approximately 320 feet of the bell and spigot clay tile pipe from CB-3 to OF-01 was abandoned and sealed (pressurized grout);

2. Brick catch basin (CB-4) was replaced with a new catch basin CB-4A near the previous location of CB-4;

3. A new catch basin (CB-20) was installed;

4. Outfall (OF-01) was abandoned and a new outfall (OF-01A) was constructed; and

5. New watertight piping was installed to connect the system catch basins to the new outfall.

No post-construction sample was obtained from the outfall to Sanders Creek (OF-01A), due to the absence of dry weather flow in September 1997. The observation by EMCON and NYSDEC personnel of the absence of dry weather flow at OF-01A confirms that the IRM was successful in preventing infiltration of groundwater to the northwestern site storm drainage system during the September 1997 sampling period. Post-construction sampling will be performed again in the Spring of 1998 to re-confirm the effectiveness of the IRM.

### 4.2.2 South Branch of Ley Creek Outfall (OF-02)

Laboratory data from the March 1997 sampling indicated that a total of 44 ppb of VOCs (1,1-DCA, 1,2-DCE, 1,1,1-TCA, and TCE) were detected at this outfall. A significant portion of the storm sewer system was replaced as part of an IRM conducted in 1992 and 1993, to eliminate the infiltration of impacted groundwater into the system. Observations of the catch basins in April 1997 indicated that groundwater appeared to enter the system through a seam in catch basin CB-5 and through the bell and spigot clay tile storm sewer lines east and south of CB-7. Although CB-5 was replaced as part of the previous IRM, settling had separated a seam in the manhole which resulted in groundwater seepage into the new system. The portion of the storm sewer system east and south of CB-7 was not replaced during the 1992 and 1993 IRMs.

To address discharges to the South Branch of Ley Creek, LMC replaced CB-5 with a one-piece (seamless) manhole which will not be subject to future separation due to settling. The old system, east and south of CB-7, is upgradient of the former metal shed, UST area, and solvent storage pad, and therefore, no further storm sewer replacement was attempted.

Post-construction dry weather flow samples (infiltrating groundwater only) were collected from the outfall to the South Branch of Ley Creek (OF-02) in September of 1997. As shown below, the sample results indicate lower concentrations of VOCs in discharges to the South Branch of Ley Creek outfall, as compared to RI samples collected in March 1997 (prior to IRM construction).

| Compound | March 1997 (Pre-IRM) Concentration (ppb) | September 1997 (Post-IRM) Concentration (ppb) |
|---|---|---|
| 1,1-Dichloroethene | 2 UJ | 0.8 J |
| 1,1-Dichloroethane | 29 J | 12 |
| c-1,2-Dichloroethene | 2 J | 0.5 J |
| 1,1,1-Trichloroethane | 5 J | 2 |
| Trichloroethene | 8 J | 0.5 |
| **Total Detected** | **44** | **15.8** |

**Notes** "J" denotes an estimated value, "U" denotes a compound which was not detected at the stated detection limit.

The post-IRM sample data have not been reviewed by a third party data validator and, therefore, have not been included in the data tables and appendices of this report. The analytical report, including this data, was provided in the Engineering Certification Report for the IRM (EMCON, November 1997).

The concentration of total VOCs detected in the post-construction sample from OF-02 was approximately 35 percent of the concentration of VOCs detected in the March 1997 sample. While VOCs persist in dry weather flow from this portion of the storm sewer system, their concentrations appear to have decreased as a result of the IRM (i.e., catch basin CB-5 replacement).

## 4.3 Groundwater Collection and Treatment System

The groundwater collection and treatment system for the site has been designed to intercept and collect groundwater containing residual VOCs from its natural flow path towards the South Branch of Ley Creek and Sanders Creek.

The system includes a collection trench and sump from which groundwater is pumped to the treatment system. The collection trench is approximately 830 feet in length, as shown in Figure 4. The collection trench discharges into a collection sump located north of Building 5. The collected groundwater is then treated prior to discharge to Sanders Creek. The design of the collection trench and treatment system is briefly described below. Details regarding the system are provided in the IRM Work Plan for the Groundwater Collection and Treatment System (EMCON, November 1997).

### 4.3.1 Groundwater Collection Trench

The conceptual design of the collection trench presented in the 1993 Remedial Action Plan Addendum was based on subsurface data from test borings and monitoring wells that paralleled the planned collection trench alignment. To prepare the final design, eight additional monitoring wells were installed during the RI to confirm the vertical and horizontal extent of VOCs in groundwater in the vicinity of the proposed collection trench alignment, and to add details regarding the depth and continuity of sand lenses that were to be intercepted. These monitoring wells were installed as part of the RI performed in accordance with the NYSDEC-approved RI/FS Work Plan. The collection trench layout specifically intercepts those areas where sand lenses have been confirmed as the pathways for VOC migration.

Based on evaluation of the test boring logs and groundwater sampling results obtained in support of this design, the depth, alignment and length of the collection trench were modified to intercept the affected subsurface media. Figure 4 shows the final alignment of the collection trench. The trench has a total length of approximately 830 feet, with a collection pipe slope of 0.2 percent. Based on variations of the surface elevation, the final depth of the collection trench ranges from 8 to 14 feet bgs. The groundwater sample results from the RI (Table 5) confirm that there were no detectable VOCs present in groundwater at either end of the trench (MW-12 and MW-19S), or below the base elevation of the trench (MW-16B, MW-17B, and MW-18B) prior to the trench construction. Accordingly, the groundwater collection trench will intercept VOC-impacted groundwater moving toward Sanders Creek and the South Branch of Ley Creek.

### 4.3.2 Groundwater Treatment System

A brief description of the groundwater treatment system is presented below. Details regarding the system design are provided in the IRM Work Plan for the Groundwater Collection and Treatment System (EMCON, November 1997).

The pumps within the collection sump transfer groundwater to a common header pipe located within the treatment building. The header pipe discharges into a diffused aeration tank air stripper to remove VOCs. The effluent from the air stripper flows by gravity to a transfer tank. From the transfer tank, the groundwater is pumped through bag filters. The treated water flows by gravity to a catch basin (CB-20) and through storm sewer piping to Sanders Creek (Outfall OF-01A).

The collection trench is designed to intercept and remove groundwater containing residual VOCs. The nature and extent of VOCs in site groundwater is discussed in Section 3 of this report. As part of the RI, samples of groundwater were also collected for metals analysis from monitoring wells within the collection area to identify the inorganic characteristics of the groundwater which would be treated. These results are presented in Table 6. Anticipated concentrations of metals and suspended solids in the treatment system influent were estimated from these data. Based on a comparison of the estimated influent concentrations for these parameters to NYSDEC effluent requirements for the system, removal of solids was also required prior to discharge to reduce certain metals concentrations (i.e., iron).

# 5 PRELIMINARY RISK ASSESSMENT

The scope of the risk assessment (RA) for the site has been developed by LMC in conjunction with NYSDEC, the New York State Department of Health (NYSDOH), and the United States Environmental Protection Agency (USEPA) through a series of correspondence and meetings.

## 5.1 Introduction and Scope

The RI process includes a RA to evaluate the potential for hazards associated with contaminants of concern (COCs) at the site. The human health component of the RA assesses risks to public health, while the ecological RA (ERA) addresses the potential for site-related contamination to impact biota. Risks are evaluated in the context of site use by humans and wildlife, available habitat, and local/regional conditions.

The human health RA will follow the guidelines established by the EPA in performing assessments for RI/FS sites (USEPA, 1989, 1990, 1992). The ERA process, developed in cooperation with and approved by the NYSDEC, the NYSDOH and the USEPA, will use a combination of the NYSDEC's Fish and Wildlife Impact Analysis (FWIA) for Inactive Hazardous Waste Sites (1992) and USEPA's ERA guidance for Superfund sites (1997). The initial step will be based on the FWIA Step I, with additional input from USEPA's ERA guidance Step 1. As part of this step, standards, criteria and guidelines (SCGs) relevant to the site will be identified. The assessment will then proceed using USEPA ERA's Steps 2 through 7. The need for completing subsequent components of the ERA (FWIA Steps III through V and USEPA ERA Step 8) will be determined during later phases of the RI/FS process.

This preliminary RA, presented as part of the draft RI Report, includes the following:

1. A Site Description, including:

    - A general description of land use in the area; and

    - An inventory of ecological resources and vegetative cover mapping.

2. A Pathway Analysis, including:

- An evaluation of all potential exposure pathways and routes, and identification of those that are potentially complete;

- Identification of SCGs; and

- Selection of COCs for both the human health RA and ecological RA.

Following resolution of coordinated NYSDEC, NYSDOH and USEPA comments on the draft RI Report, the remaining steps of the RA will be completed and submitted with the final RI Report.

## 5.2 Site Description

The following site characterization survey incorporates the components of FWIA Step I. The purpose of the survey was to evaluate the site and nearby surrounding area, to document the occurrence of wildlife species and habitat present at the site, and to examine the potential pathways for contamination migration to affect fish and wildlife species found in the area.

A site visit was conducted on August 14, 1997 to observe the environmental setting of the site. On-site and nearby off-site areas were visually inspected for observation of human activity and wildlife. Human use of the area was evaluated based on the accessibility and appeal of the area, and recent use evidenced by footprints, fresh foot pathways or recently deposited trash. Avian species were identified by sight, song, or calls. Mammals were identified by sight, nest, burrow, track or scat. Fish were observed by sight. Plant species were also identified along with the location at which they were present.

Biological information regarding the site was also gathered by contacting various Federal and State agencies, including the NYSDEC, the United States Department of Agriculture (USDA) and the United States Fish and Wildlife Service (USFWS), as follows:

| | |
|---|---|
| NYSDEC | Division of Environmental Permits |
| NYSDEC | Wildlife Resource Center/National Heritage Program |
| NYSDEC | Freshwater Wetlands Map |
| NYSDEC | Regional Bureau of Fisheries |
| USDA | Soil Conservation Service, Soil Survey |
| USFWS | National Wetland Inventory (NWI) |
| USFWS | Cortland Field Office |

Information obtained from these offices regarding the environmental setting at the site is included as Appendix E.

The site consists of former manufacturing buildings and a paved parking lot. The site is bordered to the north by a small strip of herbaceous vegetation, Sanders Creek, and Route 298 (a 4-lane highway). Other boundaries are formed to the east by Deere Road, to the south by industrial/commercial buildings, and to the west by a wooded corridor and the South Branch of Ley Creek. This corridor varies in width along the South Branch of Ley Creek from approximately 200 feet across (near Route 298), to up to 800 feet across near the southern site boundary.

As described in Section 4, several IRMs have been completed at the site, including removal of VOC-impacted soils and installation of a groundwater collection and treatment system. The treatment building is located near the northwest corner of Building 5.

### 5.2.1 Stream Classification

Both the South Branch of Ley Creek (NYSDEC Waters Index No. P154-3-2) and Sanders Creek (NYSDEC Waters Index No. P154-3-3), which form the west and north site boundaries, are designated Class C waters by the NYSDEC in the sections adjacent to the site. Information from the NYSDEC Region 7, Division of Permits, has indicated that the South Branch of Ley Creek is a Protected Stream Area north of Route 298 near NYSDEC Wetland SYE-6. Sanders Creek flows into the South Branch of Ley Creek immediately north of the site. The South Branch of Ley Creek continues north approximately 1,500 feet to its confluence with the North Branch of Ley Creek, where Ley Creek begins. Ley Creek flows west to Onondaga Lake approximately 5 miles downstream of the site.

### 5.2.2 Human Site Use

Due to its small size, isolated nature, and presence between manufacturing buildings and highways, the vegetated areas along the South Branch of Ley Creek and Sanders Creek near the site offer no particular recreational value to humans. The nearest residential area is over ½ mile to the south.

During the site inspection, there was no evidence of recent use of the area by the public. Trash observed near the creek banks appeared to have been washed downstream from upstream sources.

### 5.2.3 Vegetation

The site, and areas along the South Branch of Ley Creek, represent highly disturbed areas that appear to have historically been filled and altered by industrial land development.

Further impacts have occurred due to powerlines, highways, railroads, and sanitary sewer line construction. The United States Geological Society (USGS) Soil Survey for Onondaga County indicates that most of the site is urban land (filled), with areas along Route 298 mapped as cut and fill lands. Both of these designations indicate severe filling and/or soil movement, which would significantly alter vegetative composition.

A land use/vegetative cover map is included as Figure 5. Plant species identified in the vicinity of the site are indicated on Table 8. Mature tree species along the South Branch of Ley Creek include black willow (Salix nigra) and eastern cottonwood (Populous deltoides) with lesser amounts of red maple (Acer rubrum), black ash (Fraxinus nigra), and slippery elm (Ulmnus rubra). Understory tree species included box elder (Acer negundo), wild raisin (Viburnum cassinoides), silky dogwood (Cornus amomum), and others.

There are no trees or shrubs along Sanders Creek west of Deere Road before the confluence with the South Branch of Ley Creek. Herbaceous vegetation consists of typical old field species in open, unforested areas. Along Sanders Creek, loosestrife (Lythrum salicaria) is dominant. No submerged or stream bed vegetation was noted in any area. All vegetation was restricted to the stream banks and areas topographically elevated above the Creek.

### 5.2.4 Aquatic Insects

Although not abundant, in several areas along the South Branch of Ley Creek some aquatic insects, such as water striders (Gerris conformis), whirligig beetles (Gyrinidae spp.) and others were noted. Tracks of crawling benthic species were noted on several mud banks. Dragonflies were present throughout.

### 5.2.5 Fish

Fish (minnows) were noted throughout the South Branch of Ley Creek. Their distribution was very spotty, and is likely attributable to physical disturbances such as channelization, sediment particle size characteristics, and other physical parameters of the stream. Two large groups of fish were noted just upstream of the site north of the Old Court Street Road crossing, and in the vicinity of the rail spur that enters the southern end of the site.

No fish were observed in Sanders Creek, although the water was extremely turbid and visibility was minimal.

Contacts with the NYSDEC (Appendix E) have indicated that no significant fishery resources are present in the subject streams.

### 5.2.6 Avian Species

Avian species noted in the study are present in Table 9 (Wildlife Species).

Several avian species were present due to the grassland/old field habitat along Sanders Creek. These species include sparrows (Spizella spp.), robins (Turdus migratorius), and starlings (Sturus vulgaris).

Other species noted along the South Branch of Ley Creek were more typical of wooded areas. Noteworthy were two species of piscivorous birds along the South Branch of Ley Creek: Green heron (Butorides virescens) and belted kingfisher (Megaceryle alcyon). Green heron utilize varied habitats including ponds, lakes, streams, marshes, sloughs, and wet meadows. Their habits and behavior can be colonial or solitary in their nesting or feeding activities. Their feeding habits include both stand and wait or slow walk techniques. Shallow water (flowing), shallow bottom or wetland vegetation, are common substrates from which heron feed. Major food groups include small fish, crustaceans, mollusks, terrestrial and aquatic insects, reptiles, amphibians, spiders, and leeches. Kingfishers breed near ponds, lakes, rivers, and streams that contain fish. Fish are a staple of this species, but they will also feed on crayfish, insects, mollusks, and tadpoles. Prey is taken by perching and diving into shallow water (less than 2 feet). The availability of small fish and suitable perches, specific habitat features that are favorable to both species, are likely to exist in the area of the site. However, the high turbidity of the water would discourage use by these birds.

### 5.2.7 Mammals

Mammalian species noted in the study area are presented in Table 9 (Wildlife Species). Four mammal species were noted during the field survey. Raccoon (Procyon lotor) tracks were observed in the mud banks of the South Branch of Ley Creek just north of the rail spur crossing. Woodchuck (Marmota monax) borrows were noted in the old field areas near the confluence of Sanders Creek and the South Branch of Ley Creek. One gray squirrel (Sciurus carolinensis) was observed on the mowed lawn area just north of the site, and one muskrat (Ondatra zibethicus) was observed in the South Branch of Ley Creek north of the site (downstream), and just north of the Route 298 traffic circle west of the site in NYSDEC Freshwater Wetland SYE-6. Muskrat are also likely to occur along other sections of the South Branch of Ley Creek closer to the site.

Although, not noted, other species likely to be found include mice, voles, shrews, and bats. Due to the limited extent of natural vegetation, the congested traffic patterns of the area roads and the degree of human presence, large mammals (e.g., deer, fox, etc.) are not expected to utilize the site or the surrounding area as habitat, although they could pass through the area using the vegetated area as a travel corridor.

### 5.2.8 Endangered, Threatened, or Special Concern Species

Contacts to both the USFWS and the NYSDEC have indicated that no Endangered, Threatened, or Special Concern Species are known to occur on or nearby the site (Appendix E).

### 5.2.9 Wetlands

Based on a review of available NYSDEC and NWI Maps, there are no Federal- or State-Regulated wetlands on-site. The NWI Map is included as Figure 6 and the NYSDEC Wetlands Map is included as Figure 7. The closest NYSDEC Wetland, SYE-6, is located 1,200 feet north (downstream) of the site. The next closest NYSDEC Wetland is SYE-29, approximately 2,400 feet southeast (upstream) of the site along the South Branch of Ley Creek.

Wetland SYE-6 has been divided into several smaller hydrologically linked areas. Major influences on SYE-6 have been industrial/urban development, road construction including the New York State Thruway, powerlines, and several smaller roads. Parts of the wetland included forested as well as emergent wetland components. The emergent areas are largely vegetated by phragmites.

The NWI map indicates that the South Branch of Ley Creek has been mapped as a ravine, lower-perennial, permanent open water wetland. This definition translates to a permanent flowing water system confined in channels. The gradient is low, and water velocity is slow. Much of the stream bottom is expected to be silt and clay. Organisms, typically able to survive in the substrate, must be able to tolerate low oxygen concentrations. Visual inspection of the stream confirms this classification.

### 5.2.10 Fish and Wildlife Resource Value

The site has been and is intended to be used as an industrial site. Therefore, the developed portion of the site does not offer any value to wildlife or potential residential use for humans.

Due to development impacts on Sanders Creek in the site vicinity, this creek offers limited value as potential wildlife habitat. Sanders Creek offers no value to humans except for stormwater conveyance and flood control.

Due to preservation of remnant mature trees along the South Branch of Ley Creek, this area does provide some value to wildlife, primarily avian species. The area serves as a corridor/greenway linking other areas. Due to configuration and size the area is not likely to be a critical breeding, nesting, or feeding area for any specific species, but does provide suitable habitat to meet the criteria for all of these activities for certain individuals of a larger population. Primary impacts to this area have resulted from habitat alterations due to development pressure, such as filling, channelization, utility construction, rail line maintenance, and road construction.

## 5.3 Pathway Analysis

Field observations and regional information, along with information from current and previous environmental investigations, are used in the pathway analysis. The pathway analysis identifies the mechanisms by which human or ecological biological receptors may be exposed to site-related contaminants. USEPA guidance defines an exposure pathway as a mechanism by which a contaminant may travel to a receptor, and an exposure route as the point of entry or contact between the receptor and the contaminated medium. Although developed for ecological assessments, these definitions are useful for both the human health RA and the ERA.

The pathways and COC evaluations for the RA are based on the assessment of the nature and extent of contamination and fate and transport issues associated with the site as presented in Section 3. Contaminated media at the site include: shallow groundwater, subsurface soil, surface water and sediment. If a medium has no potential for contact with receptors, the exposure pathway is considered incomplete. An ecological receptor is defined as a plant or animal population, community, habitat, or sensitive environment. A public health receptor is a human individual or population. COCs for the RA are then selected based on the complete routes and pathways for site-related contaminants.

The general contaminant pathways are discussed in the Pathway Overview (Section 5.3.1). Actual exposure routes are then identified based on the presence of potential receptors that could contact affected media. Identification of complete exposure routes is based on the site-specific evaluations that appear for human health and ecological endpoints in Sections 5.3.2 and 5.3.3, respectively.

### 5.3.1 Pathway Overview

As presented in Section 3.3, media at the site that contain site-related COCs are soil, groundwater, surface water and creek sediment. General characteristics of the contamination in each of these media is discussed below.

**Soil**

It should be noted that, as described in Section 3.3.1, contaminated soils in the unsaturated (vadose) zone and shallow saturated zone have been removed as part of previous IRMs. Therefore, there are no existing contaminant migration pathways associated specifically with soils. Residual subsurface soil contamination in the saturated zone is addressed by the groundwater pathway discussion that follows.

**Groundwater**

The nature and extent of groundwater contamination is described in Section 3.3.2. Characteristic of groundwater contamination at the site is the presence of chlorinated and aromatic VOCs, principally 1,1-DCA. The highest levels are near identified former source areas (i.e., the UST area and the solvent storage pad area), with rapid attenuation downgradient.

Contamination is almost entirely limited to the shallow (upper clay/silt) unit, which provides a pathway for horizontal migration through sand lenses. Migration to the deeper (sand) unit is minimized by the presence of upward gradients and low vertical permeability of the overlying clay and silt units.

At the site, the South Branch of Ley Creek and Sanders Creek serve as a discharge zone for shallow groundwater. However, based on the presence of the groundwater collection and treatment system IRM and the general absence of contamination beyond it, VOCs will not reach either creek via groundwater discharge.

Historically, the storm sewer system served as an artificial contaminant transport pathway to surface water through infiltration of VOC-impacted groundwater and subsequent discharge at the outfalls. The IRMs for the storm sewer system (described in Section 4) have eliminated the infiltration of groundwater to the storm sewer system that discharges to outfall OF-01A to Sanders Creek (as evidenced by absence of dry-weather flow). Dry-weather discharge to the South Branch of Ley Creek (OF-02) still occurs. This discharge shows lower concentrations of COCs than it did prior to the improvements, but the pathway remains complete.

Volatilization of VOCs from shallow groundwater to air is a complete pathway. Surficial soil gas measurements completed in 1992 and discussed in the 1993 Remedial Action Plan have confirmed that trace levels of VOCs are migrating from the subsurface to the surface within the area encompassed by the groundwater collection and treatment system. The presence of pavement eliminates this pathway within the on-site areas. However, volatilization could potentially occur in the area of the corridor between the paved areas and the South Branch of Ley Creek

**Surface Water**

The only existing point of entry of site-related contamination to surface water is via groundwater infiltration discharges at OF-02 to the South Branch of Ley Creek. The downstream surface water sample collected at SW-04 during the RI, did not show concentrations higher than those upstream, indicating that the site is not having a net effect on surface water quality. Any exposure potential associated with the discharge to surface water is therefore localized. As discussed in Section 3.3.3, this observation is supported by the high tendency of site COCs to volatilize from surface water into air. Therefore, downstream surface water transport, while potentially complete, is not significant.

Surface water contaminants can theoretically be taken up by local biota. However, none of the site COCs has a high bioconcentration potential. A measure of the tendency for bioaccumulation is the bioconcentration factor (BCF), a limitless ratio between the tissue concentration and the exposure medium (e.g., water). BCFs for chemicals with a tendency for significant food chain accumulation are generally 1,000 ($10^3$) or higher. Of the site COCs, the highest water-to-tissue BCFs identified (Howard, 1990) were for TCE, reportedly ranging from 17-39 (well under $10^2$). This shows a low tendency for bioaccumulation, described by the author as "not important."

Preliminary COCs for the site (see Section 5.3.4) were identified as having the following BCFs (Howard, 1990):

- Acetone (0.69);
- Carbon disulfide (7.9);
- 1,1-dichloroethane (0.67-0.86);
- 1,1-dichloroethene (No experimental data; no significant bioaccumulation expected);
- 1,2-dichlorethene (15- 22);
- Methylene chloride (5);
- Trichloroethene (17-39);
- cis-1,2-dichloroethene (15);
- 1,1,1-trichloroethane (8.9); and
- Vinyl chloride (7)

**Creek Sediment**

The presence of site COCs in OF-02 indicates a potential for release of contaminants to sediments. As discussed in Section 3.3.4, there is no evidence that sediments are specifically affected by site discharges.

As discussed for surface water, COC transport from sediments into biota would not be a significant fate mechanism for site COCs due to their low bioaccumulation potential.

**Summary**

In summary, contaminated media associated with the site are shallow groundwater, surface water and sediment. The major transport pathways are limited discharge of shallow groundwater to surface water at OF-02, and subsequent volatilization, with possibly some deposition in sediments.

### 5.3.2 Human Health

Potential public health exposure mechanisms are addressed below for groundwater, surface water and creek sediment.

**Groundwater**

Typical groundwater exposure routes are:

- Consumption of domestic water (drinking water, food, beverage);
- Inhalation of COCs volatilized into indoor air (general air and while showering);
- Incidental dermal contact (during subsurface activities);
- Dermal contact during water use (e.g., bathing);
- Consumption of produce that has taken up contaminants from groundwater that was used for irrigation; and
- Inhalation of COCs volatilized into ambient air (during subsurface activities).

The first four exposure routes (water consumption, indoor air inhalation, dermal contact and produce consumption) are all based on use of the associated groundwater unit as a domestic water supply. Shallow groundwater at or downgradient of the site cannot be used as a water supply because of limited yield potential (permeability ranging from $10^{-4}$ cm/sec to $10^{-6}$ cm/sec) and extent. In the areas where VOC-impacted groundwater is present, the shallow groundwater is intercepted by the groundwater collection and treatment system precluding discharge to the South Branch of Ley Creek and Sanders Creek. Therefore, shallow groundwater use at the site as a domestic water supply is not feasible now or in the future.

Deeper groundwater in the sand interval could yield adequate water for domestic use. However, all detectable contamination is within site boundaries at relatively low levels. The deep groundwater results for the sand unit confirm that COCs are not migrating off site in this unit (Section 3.3.2). Since the site is used for industrial purposes, there is no potential for development of a domestic water supply on site. Furthermore, the Town of Dewitt is entirely served by public water. In the site vicinity, the water is purchased by the Town from either the Metropolitan Water Board or the Onondaga County Water Authority. The Metropolitan Water Board obtains its water from the Skaneateles Lake.

The Onondaga County Water Authority obtains its water from Otisco Lake or Lake Ontario. Due to the limited area available on the Onondaga County property, and the lack of agricultural land use in the surrounding area, it is very unlikely that an irrigation supply would ever be developed. There is no use of groundwater in the area for either municipal or private supplies, nor will there be any in the foreseeable future. All exposure routes associated with groundwater use are therefore incomplete under both current and future hypothetical conditions.

The presence of the site in a highly industrial area as well as in a floodplain preclude any future residential use. However, the site may undergo future commercial development. As with subsurface soil, associated construction activities could result in transient worker exposure to subsurface groundwater. Possible exposure routes are incidental dermal contact and inhalation of volatilized COCs.

**Surface Water**

Surface water exposure routes in the South Branch of Ley Creek can occur as follows:

- Incidental ingestion (during primary or secondary recreational use);
- Dermal contact (during primary or secondary recreational use);
- Inhalation of COCs volatilizing from the water surface; and
- Consumption of fish that have bioaccumulated contaminants from surface water.

The first three exposure mechanisms assume some public use of the area, which has minimal likelihood of occurring. Access to this area is, at best, difficult, due to the isolated nature of the creek corridor and its presence amidst industrial and commercial development. Fishermen would not be attracted due to the absence of game fish. Access to this segment of the creek is extremely limited. Assuming continued future industrial/commercial use of the site, it is unlikely that the South Branch of Ley Creek would serve as a recreational resource.

Onondaga County personnel, engaged in clearing the South Branch of Ley Creek of debris, could contact surface water. Such types of contact, if any, would be transient and infrequent.

Overall, the human exposure routes to the South Branch of Ley Creek within the area of concern are potentially complete. However, given the very low likelihood of public use, and the transient nature of any contact with impacted media, these exposure mechanisms are de minimis and do not warrant further characterization.

Fish consumption exposures are incomplete. The NYSDEC has confirmed that there are no fishery resources in the area (Appendix E). Fish in the site area are limited to minnows. Given the trace concentrations and volatile nature of the COCs detected in surface water, there is no potential for measurable downstream transport to areas where game fish may exist. Based on the low potential of site COCs for bioaccumulation and the small size of the fish observed, it is not anticipated that the fish in the site area could serve as a contaminated food source to larger fish in downstream areas that might be consumed by humans.

All human health exposure routes associated with surface water are either de minimis or incomplete.

**Sediment**

Typical sediment exposure mechanisms are:

- Incidental ingestion (during primary or secondary recreational use);
- Dermal contact (during primary or secondary recreational use); and
- Consumption of fish that have bioaccumulated contaminants from sediments.

As with surface water, direct contact routes are incomplete because of the general absence of current or future use of the area. It is highly unlikely that game fish would have contact to the sediments in this area, due to the absence of suitable habitat. As such, there is no anticipated pathway to humans through fish consumption.

All human health exposure routes associated with creek sediment are incomplete.

**Summary**

Table 10 summarizes the significance of the human health exposure routes described above. There are no potential human health pathways to site COCs under current or anticipated future conditions. Future site development may present a potential for transient contact by workers with subsurface contamination (soil, groundwater) through incidental ingestion, dermal contact or inhalation. However, it is unlikely that any excavation would be allowed within the area of the site hydraulically influenced by the groundwater collection and treatment system because such excavation would have the potential of interfering with the IRM program at the site and would be a change of site use controlled by the NYSDEC under its Part 375 regulations.

### 5.3.3 Ecological

As described in Section 5.2, the site is located in an urbanized/industrial area surrounded by various industrial activities. Due to the existence of buildings and pavement, there is no on-site habitat for wildlife. The nearby watercourses (South Branch of Ley Creek and Sanders Creek) and adjacent vegetated areas offer limited habitat for wildlife.

As a general note, USEPA ERA guidance indicates that physical stresses unrelated to contaminants should not be the focus of the ERA. However, it is important to consider site contamination in the context of the physical setting. Industrialization and development of the site area and nearby stream locations severely limits the available habitat.

Potential ecological exposure routes to be considered are:

**Terrestrial Animals**

- Inhalation of volatilized contaminants from surface water;
- Incidental surface water ingestion;
- Surface water ingestion for drinking;
- Soil ingestion;
- Inhalation of volatilized contaminants from subsurface soil;
- Sediment ingestion;
- Dermal absorption of COCs from surface water;
- Dermal absorption of COCs from sediment; and
- Consumption of aquatic life that has bioaccumulated contaminants.

**Terrestrial Plants**

- Root absorption; and
- Leaf absorption (gaseous).

**Aquatic Animals**

- Direct contact with surface water;
- Direct contact with sediment; and
- Consumption of aquatic life that has bioaccumulated contaminants.

**Aquatic Plants**

- Root absorption; and
- Leaf absorption.

Due to the presence of pavement, there is no potential for contact between wildlife and contaminants at the site. On the forested Onondaga County property, between the paved area and the collection trench, subsurface contamination is present within the saturated zone. However, it is too deep to present a risk of contact, since the saturated zone is several feet deep in those areas. Direct contact routes associated with subsurface contamination are therefore incomplete.

As discussed in Section 5.3.1, there may be some low-level minimal volatilization from the subsurface to ambient air. This exposure mechanism is considered de minimis because of the minimal air impacts anticipated.

Volatilization from surface water to ambient air is an important removal mechanism for surface water COCs, but is of de minimis air quality concern due to the low VOC concentrations observed. Actual ambient air impacts to any ecological receptors along the South Branch of Ley Creek are not likely to result.

All of the other pathways indicated above are potentially complete. Surface water ingestion, use of surface water and sediment as an aquatic habitat, and associated bioaccumulation up the food chain (dietary exposure to piscivorous wildlife) are potentially complete exposure routes in the vicinity of the site. Habitats downstream of the site would not be impacted, as transport in either surface water or sediment beyond the immediate site is not likely based on the transport characteristics of the COCs.

In summary, pathways and exposure routes related to surface water and sediment represent the only potential ecological exposure mechanisms associated with site COCs. Table 11 summarizes the complete ecological exposure pathways and routes for the site.

### 5.3.4 Preliminary Chemicals of Concern (COCs)

Based on data generated during the RI, COCs present within the ecological pathways at the site are mostly chlorinated VOCs. These contaminants are generally highly volatile in character and were detected at trace levels in surface water and stream sediment. Specific constituents detected in surface water and sediment include:

- Acetone;
- Carbon disulfide;
- 1,1-dichloroethane;
- 1,1-dichloroethene;
- 1,2-dichlorethene;
- Methylene chloride;
- Trichloroethene;
- cis-1,2-dichloroethene;
- 1,1,1-trichloroethane; and
- Vinyl chloride.

To be conservative, all detected chemicals in the creeks or in outfalls leading to the creeks that are potentially site related will be included as preliminary COCs. These criteria are met for all the chemicals above with the exception of carbon disulfide and acetone. Carbon disulfide was not detected in site groundwater or soils. It is a naturally occurring compound found in marine sediments or freshwater marshes and is produced by the action of microbes (USEPA, 1998). Acetone was also not detected in other site media, and is frequently a result of laboratory artifact. Methylene chloride is also a suspected lab contaminant, but has been retained at this point because it was reported in one groundwater sample.

It should be noted that upstream contamination with chlorinated VOCs exists, and that the site shows no net contribution to environmental concentrations in the South Branch of Ley Creek.

It should also be noted that by including the outfall sample results as well as the stream data, the list of potential site contaminants has been expanded to include 1,1,1-TCA and vinyl chloride. However, none of these parameters were detected in actual surface water or sediment samples from the South Branch of Ley Creek. This is most likely attributable to the low concentration at which the compounds are present and the rapid volatilization of these compounds.

The VOCs identified as preliminary COCs and carried through subsequent evaluation will be those detected above relevant screening values or which showed substantial elevation (e.g., a several-fold increase in concentration) in samples at or downstream of the site compared with upstream. The screening evaluation is presented below.

### 5.3.5 Screening Evaluation

Screening ecotoxicity values are defined as concentrations that represent conservative thresholds for adverse ecological effects. Potentially applicable screening levels for surface water and sediment are identified below. The screening levels and associated surface water and sediment concentrations are summarized in Table 12 and Table 13, respectively. The discharge to Sanders Creek is included for historical perspective, even though this release has been eliminated through an IRM.

**New York State Surface Water Standards**

New York State has promulgated surface water standards for Class C streams. However, there are no Class C standards for site-related COCs.

**USEPA Ambient Water Quality Criterion (AWQC)**

AWQC (USEPA, 1986) are surface water concentrations designed to be protective of aquatic life on either an acute or chronic basis. No specific AWQC for the protection of aquatic life from chronic effects are available for site-related COCs. However, in evaluating the database for each chemical, the USEPA has estimated the lowest concentrations at which toxicity occurs. Such values are available for two of the COCs

(1,1,1-TCA and TCE) and for a compound (1,2-DCA) closely related to another site-related COC (1,1-DCA). These values appear in Table 12.

**Preliminary Remediation Goals (PRGs)**

The United States Department of Energy (USDOE, 1996) has developed PRGs for toxicity screening in ecological RAs. PRGs established by Oak Ridge National Laboratory (ORNL) for VOC COCs are based on protection of aquatic life on a chronic basis and, therefore, are appropriate for screening. PRGs for site-related COCs are shown in Table 12 and Table 13.

**USEPA Ecotox Thresholds**

Ecotox Thresholds (ETs) (USEPA, 1996) are defined as "media-specific contaminant concentrations above which there is sufficient concern regarding adverse ecological effects to warrant further site investigation." They are specifically designed for screening of surface water and sediment. The ET software calculates ETs for sediments using equilibrium partitioning. A typical total organic carbon concentration of 2.5 percent was used in the program. Site-specific total organic carbon in creek sediments presented in Table 7, were 2.2 percent and 2.7 percent.

The ETs generated appear in Table 12 and Table 13.

**New York State Sediment Guidance Screening Value**

The NYSDEC Division of Fish and Wildlife has developed sediment screening values for individual chemicals based on a variety of endpoints. There are no screening values available for site-related COCs based on protection of aquatic life. For one COC (TCE), there is a screening value based on human health. This is not an appropriate ecological risk screening value and has not been considered.

**Summary**

Table 12 and Table 13 show the maximum site concentrations, including outfalls, compared against the lowest screening values identified. The only result that exceeded the lowest screening value was 1,1-DCA in the outfall to Sanders Creek water sample. This finding exceeded a surface water screening value as shown in Table 12. Actual concentrations in the creek at the time are not known, and were undoubtedly far lower. Regardless, this discharge of COCs has been eliminated by the IRM. There are no exceedances of screening values associated with the potentially complete pathway, discharge to the South Branch of Ley Creek at OF-02.

### 5.3.6 Preliminary Risk Conclusions

There are no currently complete human health exposure pathways for site-related COCs. However, the potential risk associated with worker contact with subsurface materials will be further addressed in the RA.

Based on the pathway analysis and screening evaluation, there are no concentrations of site-related COCs in surface water or sediment that could present an ecological concern. No further ecological evaluation is required.

# 6 CONCLUSIONS

This document presents the results of the RI performed at the Former GE Court Street Building 5/5A site. The RI included the drilling of soil borings, the installation of monitoring wells and piezometers and the sampling of soil, groundwater, surface water and sediment. The information obtained was used to define the nature and extent of contamination at the site, and to assess current site conditions within the context of the completed and ongoing IRMs for the site. The IRMs for the site include the removal of VOC-impacted soils in the former UST area, the former solvent storage pad area and the former metal shed area; the rehabilitation of the storm sewer system to mitigate the migration of VOC-impacted water to Sanders Creek and the South Branch of Ley Creek; and, the construction of a groundwater collection and treatment system to prevent the migration of VOCs toward Sanders Creek and the South Branch of Ley Creek. Additional testing was also performed to assess the potential presence of PCBs in the soil adjacent to a transformer pad on the north site of Building 5.

A findings summary, presented in the context of the stated objectives in the NYSDEC-approved RI/FS Work Plan, is presented below. The findings summary is followed by a statement of the major conclusions of the RI.

## 6.1 Findings Summary

The vertical extent of VOCs in the former UST area and solvent storage pad area has been defined. In 1992, VOC-impacted soil removal activities were completed. Post-removal sampling completed at that time confirmed that the mass of VOC-impacted soils were removed from the unsaturated soils and the upper saturated zone, to the extent possible, by excavation. The NYSDEC-approved RI/FS Work Plan included deep soil borings in the former UST area and the former solvent storage pad area to evaluate vertical migration of VOCs. RI sampling of saturated zone soils beneath the former UST area and the former solvent storage pad area indicate that there is no evidence of a non-aqueous phase liquid (NAPL), and that the residual VOCs are limited to a depth interval beneath the former UST excavation that is present well below the water table, but confined above the underlying sand unit. The presence of residual VOCs at these intervals is related to VOC-impacted groundwater.

The vertical and horizontal extent of groundwater impacted by VOCs has been defined. Shallow VOC-impacted groundwater has been identified and the extent has been delineated. Drawing 6 shows the horizontal extent of the VOC impacts to the shallow groundwater system. A groundwater collection and treatment system has been installed to collect and remove VOC-impacted groundwater. It is expected that the operation of the system will eliminate migration of VOC-impacted groundwater towards Sanders Creek and the South Branch of Ley Creek. Isolated, low level VOCs in the deeper sand unit have been identified at one location (MW-1D) west of Building 5. Downgradient sample locations in this system do not detect any significant concentrations of VOCs. Vertical migration of VOCs from the shallow system to the deeper sand is not a significant mechanism due to upward gradients observed between these units and the low vertical permeability of the geologic units overlying the sands.

PCBs in the soil adjacent to the transformer pad on the north side of Building 5 were not present at levels which require further action. This transformer pad was removed by the Building 5 property owner (DE & JD) during renovation activities completed in October 1997.

The sanitary sewer line operated by Onondaga County west of Building 5 does not act as a preferential groundwater flow path. The groundwater elevation data confirm that there is no preferential flow along the sewer line. The elevation data are consistent with the overall configuration of the surficial groundwater flow regime at the site. The surficial groundwater regime is topographically controlled and there is no evidence of any convergence of flow in the vicinity of the sewer line that would indicate a preferential pathway.

RI activities identified infiltration of VOC-impacted groundwater into site storm sewer systems which discharge to Sanders Creek and to the South Branch of Ley Creek. These discharges did not result in a net impact to surface water quality in the South Branch of Ley Creek, where surface water samples were taken. IRM actions were taken in August 1997 (in addition to similar IRM activities completed in 1992 and 1993) to eliminate the discharge to Sanders Creek, and to minimize the discharge to the South Branch of Ley Creek.

The migration of VOC-impacted groundwater at the site has not impacted surface water quality in the South Branch of Ley Creek, based on comparison of upstream and downstream samples, and the identified lateral extent of VOC-impacted shallow groundwater.

VOC analysis of sediment samples collected upstream and downstream of Sanders Creek and the South Branch of Ley Creek outfalls was performed. There was no identifiable impact to sediment quality at the Sanders Creek outfall. A potential concentration gradient was observed between the upgradient and downgradient samples in the South

Branch of Ley Creek. However, because of the trace levels present in both South Branch of Ley Creek samples, no conclusive impact to the sediments from the outfall has been identified. Since these samples were obtained from worst-case locations to identify sediment impact and no adverse impact was found, and because no significant ecological or human health risk is associated with the sediment concentrations identified (based on screening analysis using sediment criteria), no further evaluation of the sediments is warranted.

All necessary data were obtained to evaluate the groundwater collection and treatment system design for control of groundwater migration toward the South Branch of Ley Creek and Sanders Creek. The groundwater collection and treatment system has been constructed. Its operation is expected to effectively prevent the migration of VOC-impacted groundwater towards Sanders Creek and the South Branch of Ley Creek.

An FS will be prepared to evaluate potential final remedial alternatives for the site. In this regard, the groundwater collection and treatment system (described in Section 4.3) is intended to be the final remedy for groundwater at the site.

## 6.2 Conclusions

An overview of the conclusions from the RI is provided below:

- The soil removal operations that were conducted in 1992 at the former UST area and former solvent storage pad area remediated the majority of the VOC-impacted soils. Additional soil sampling was conducted as part of this RI to define the vertical extent of the residual VOCs in both areas. Beneath the excavation for the UST area, VOCs are detectable in saturated soil samples well below the water table. VOCs were detected at only trace levels beneath the former solvent storage pad. VOC-impacted groundwater has migrated downgradient of the former UST area in the shallow groundwater system. Based on this finding, a groundwater collection and treatment system IRM has been initiated. No further remedial action relative to residual VOCs in soils is warranted.

- Soils adjacent to the transformer pad on the north side of Building 5 did not contain PCBs at levels which require further action. All samples were below the 1 ppm cleanup objective referenced in the NYSDEC TAGM HWR-94-4046 for surface soils.

- The vertical and horizontal extent of VOC-impacted groundwater has been defined. The data collected confirm that the alignment and depth of the groundwater collection trench are appropriate and will prevent the migration of

VOC-impacted groundwater towards Sanders Creek and the South Branch of Ley Creek.

- The sanitary sewer line that traverses the Onondaga County property is not acting as a preferential pathway for groundwater flow. The soils encountered and the configuration of the groundwater table (i.e., the piezometer elevation data in the context of site-wide groundwater elevations) do not indicate the presence of higher permeability materials along the sanitary sewer line. Accordingly, the sanitary sewer line is not a preferential pathway for the off-site migration of VOC-impacted groundwater.

- Groundwater discharges to the South Branch of Ley Creek are not impacting surface water quality. Surface water samples taken both upgradient and downgradient of the VOC-impacted groundwater area exhibited low levels and comparable concentrations of VOCs. These results confirm the conclusions of the 1993 Remedial Action Plan Addendum that the surface water quality of the South Branch of Ley Creek is not being impacted by groundwater migrating from the site.

- Analysis of the storm sewer outfalls for the South Branch of Ley Creek and Sanders Creek indicate that there were minor contributions of VOCs from the infiltration of VOCs in the storm sewer system. These contributions are not expected to adversely impact the South Branch of Ley Creek (supported by the results of RI surface water sampling discussed above) or Sanders Creek. Subsequent to the RI sampling of these outfalls, an IRM was completed to minimize infiltration of VOC-impacted groundwater to the storm sewers. Based on the first round of post-construction samples, this IRM resulted in the elimination of groundwater infiltration to the storm sewer system that discharges to Sanders Creek, and a significant reduction of VOC-impacted groundwater infiltrating into the storm sewer system discharging to the South Branch of Ley Creek. It is likely that VOCs entering the South Branch of Ley Creek are readily volatilized, thus limiting downstream migration. Post-construction sampling will be performed at these outfalls again in the Spring of 1998, and on a semi-annual basis thereafter until the FS is completed for the site. In the event that significantly higher VOC concentrations are detected, additional storm sewer IRMs will be considered.

- VOC analysis of sediment samples collected upstream and downstream of Sanders Creek and the South Branch of Ley Creek outfalls was performed. There was no identifiable impact to sediment quality at the Sanders Creek outfall. A potential concentration gradient was observed between the upgradient and downgradient samples in the South Branch of Ley Creek. However, because of the trace levels present in both South Branch of Ley Creek samples, no conclusive impact to the sediments from the outfall has been identified. Since these samples were obtained from worst-case locations to identify sediment impact and no adverse impact was found, and because no significant ecological or human health risk is associated with the sediment concentrations identified (based on screening analysis using sediment criteria), no further evaluation of the sediments is warranted.

- As part of the RI, preliminary ecological and human health risk assessments were performed. A component of the risk assessment included a pathway analysis that identifies the mechanisms by which human or ecological receptors may be exposed to VOCs. The major ecological transport pathways at the site are discharge of VOCs to surface water at the South Branch of Ley Creek stormwater outfall and subsequent volatilization. However, there are no VOC concentrations in surface water or sediment that could present an ecological concern, based on screening analysis. There are no currently complete human health exposure pathways. Future exposure scenarios that would result from a substantial change in site use, as this term is defined at 6 NYCRR Part 375-1.3(v), are controlled at the site by the NYSDEC under the provisions of its Part 375 regulations that govern new uses of sites.

- Sufficient data have been obtained to characterize the site in support of an FS. The FS evaluation of potential remedial alternatives will focus on the groundwater collection and treatment system IRM as being the final remedy for site groundwater.

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# TABLES

**Table 1**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Monitoring Well Construction Details**

| Well | Ground Surface Elevation (ft. NGVD) | PVC Casing Elevation (ft. NGVD) | Total Depth Well (ft. BGS) | Screen Interval BGS (ft. BGS) |
|---|---|---|---|---|
| **Deep Wells** | | | | |
| MW-1D | 381.82 | 381.29 | 35.5 | 32.4-34.9 |
| MW-2D | 382.07 | 381.3 | 47.1 | 41.7-46.7 |
| MW-3D | 380.55 | 379.89 | 36.1 | 32.7-35.7 |
| MW-5D | 383.47 | 383.15 | 27.3 | 22.0-27.0 |
| MW-6D | 383.31 | 385.58 | 38.5 | 34.0-37.0 |
| PZ-1 | 384.54 | 384.94 | 34.6 | 29.0-34.0 |
| **Intermediate Wells** | | | | |
| MW-1I | 381.8 | 381.46 | 28.4 | 23.0-28.0 |
| MW-2I | 382.07 | 381.89 | 29.4 | 24.0-29.0 |
| **Shallow Wells** | | | | |
| MW-1S | 381.82 | 381.62 | 14.8 | 4.4-14.4 |
| MW-2S | 382.08 | 381.83 | 14.9 | 4.5-14.5 |
| MW-3S | 380.74 | 380.4 | 16.5 | 6.1-16.1 |
| MW-4S | 379.75 | 379.55 | 14.8 | 4.4-14.4 |
| MW-5S | 383.41 | 383.19 | 13.9 | 3.5-13.5 |
| MW-6S | 383.41 | 385.81 | 14.5 | 4.0-14.0 |
| MW-7S | 382.01 | 384.45 | 14.8 | 4.0-14.0 |
| MW-8S | 379.34 | 378.96 | 14 | 3.0-13.0 |
| MW-9 | 383.08 | 385.11 | 12 | 7.0-12.0 |
| MW-10 | 384.17 | 386.11 | 12 | 7.0-12.0 |
| MW-11 | 382.73 | 384.25 | 12 | 7.0-12.0 |
| MW-11R | 382.66 | 385.71 | 12 | 7.0-12.0 |
| MW-12 | 383.4 | 384.99 | 12 | 7.0-12.0 |
| MW-13 | 381.92 | 384.05 | 12 | 7.0-12.0 |
| MW-14 | 379.33 | 381.22 | 10 | 5.0-10.0 |
| MW-15 | 380.28 | 382.1 | 12 | 7.0-12.0 |
| MW-16A | 379.57 | 379.3 | 8.5 | 2.5-8.5 |
| MW-16B | 379.67 | 379.27 | 22 | 11.5-21.5 |
| MW-17A | 381.76 | 384.11 | 12 | 2.0-12.0 |
| MW-17B | 381.76 | 384.22 | 24 | 15.0-23.0 |
| MW-18A | 382.84 | 385.18 | 10 | 2.0-10.0 |
| MW-18B | 382.6 | 384.83 | 24 | 13.0-23.0 |
| MW-19S | 379.56 | 379.31 | 10.5 | 3.0-10.0 |

Notes: 1. NGVD - National Geodetic Vertical Datum of 1929.
2. BGS - Below ground surface.

**Table 2**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Monitoring Well, Staff Gauge, and Piezometer Transect Groundwater Elevation Data**

| Well | Location | | Reference | GW Elev | GW Elev | GW Elev |
|---|---|---|---|---|---|---|
| | Easting | Northing | Elevation | 3/11/97 | 4/23/97 | 6/16/97 |
| **Deep Wells** | | | | | | |
| MW-1D | 5181.99 | 4532.75 | 381.29 | 381.31 | 380.78 | 379.85 |
| MW-2D | 5047.62 | 4785.76 | 381.30 | 380.54 | 380.60 | 379.68 |
| MW-3D | 5079.13 | 4890.13 | 379.89 | 380.98 | 380.43 | 379.55 |
| MW-5D | 5440.89 | 4035.70 | 383.15 | 382.28 | 381.22 | 380.30 |
| MW-6D | 5040.11 | 4640.26 | 385.58 | 381.91 | 380.68 | 379.76 |
| PZ-1 | 5824.76 | 4427.88 | 384.94 | 382.67 | 381.08 | 380.15 |
| **Intermediate Wells** | | | | | | |
| MW-1I | 5177.21 | 4530.56 | 381.46 | 381.04 | 380.82 | 379.88 |
| MW-2I | 5047.42 | 4789.21 | 381.89 | 380.76 | 380.77 | 379.59 |
| **Shallow Wells** | | | | | | |
| MW-1S | 5172.235 | 4530.19 | 381.62 | 381.61 | 380.57 | 379.47 |
| MW-2S | 5045.08 | 4792.10 | 381.83 | 380.52 | 378.80 | 377.33 |
| MW-3S | 5087.36 | 4890.01 | 380.40 | 378.09 | 377.43 | 377.23 |
| MW-4S | 5015.44 | 4937.24 | 379.55 | 377.03 | 377.45 | 376.74 |
| MW-5S | 5445.71 | 4039.51 | 383.19 | 381.32 | 380.69 | 380.11 |
| MW-6S | 5047.75 | 4625.57 | 385.81 | 382.47 | 380.17 | 377.11 |
| MW-7S | 4962.16 | 4801.27 | 384.45 | 380.86 | 378.59 | 376.26 |
| MW-8S | 4949.37 | 5064.80 | 378.96 | 377.41 | 376.79 | 376.01 |
| MW-9 | 4921.46 | 4866.19 | 385.11 | 380.22 | 378.23 | 376.37 |
| MW-10 | 4890.00 | 4816.34 | 386.11 | 380.52 | 378.24 | 376.18 |
| MW-11 | 4980.68 | 4637.94 | 384.25 | 380.46 | 378.12 | 376.06 |
| MW-11R | 4986.56 | 4641.18 | 385.71 | - | - | - |
| MW-12 | 5089.75 | 4476.38 | 384.99 | 380.63 | 377.73 | 375.82 |
| MW-13 | 4863.08 | 4719.96 | 384.05 | 376.08 | 375.05 | 373.95 |
| MW-14 | 4821.16 | 4730.32 | 381.22 | 374.77 | 374.72 | 374.21 |
| MW-15 | 4766.15 | 4972.84 | 382.10 | 379.23 | 376.99 | 374.95 |
| MW-16A | 4999.16 | 4964.28 | 379.30 | 377.01 | 377.19 | 376.64 |
| MW-16B | 4994.34 | 4962.42 | 379.27 | 377.43 | 377.49 | 376.72 |
| MW-17A | 4851.66 | 4826.16 | 384.11 | 379.51 | 377.53 | 375.89 |
| MW-17B | 4847.80 | 4832.47 | 384.22 | 379.63 | 377.64 | 376.04 |
| MW-18A | 4964.94 | 4628.08 | 385.18 | 378.88 | 376.92 | 374.93 |
| MW-18B | 4968.13 | 4622.99 | 384.83 | 379.44 | 377.98 | 376.33 |
| MW-19S | 5168.42 | 5049.68 | 379.31 | - | - | 377.14 |
| **Staff Gauges** | | | | | | |
| SG-1 Nail | 5577.03 | 5025.35 | 376.78 | 374.88 | 374.61 | 374.54 |
| SG-2 | 5113.47 | 5166.29 | 374.52 | 372.93 | 372.66 | 372.62 |
| SG-3 | 4919.33 | 5232.19 | 374.34 | 372.88 | 372.88 | 372.17 |
| SG-4 Nail | 4851.04 | 4673.35 | 376.73 | 374.78 | 374.54 | 374.38 |
| SG-5 Nail | 5084.51 | 4220.49 | 378.79 | 375.87 | 375.43 | 375.47 |
| **Sanitary Sewer Transects** | | | | | | |
| T1 West | 5031.16 | 4503.18 | 383.99 | 377.75 | 376.24 | 374.97 |
| T1 Center | 5037.27 | 4508.48 | 385.06 | 377.41 | 377.42 | 376.16 |
| T1 Edge | 5039.86 | 4510.19 | 384.15 | 379.01 | 376.76 | 375.07 |
| T1 East | 5043.29 | 4513.76 | 384.04 | 379.63 | 377.06 | 375.14 |
| T2 West | 4935.54 | 4634.27 | 384.96 | 376.13 | 375.03 | 374.18 |
| T2 Center | 4942.77 | 4637.48 | 385.59 | 377.08 | DRY | DRY |
| T2 Edge | 4945.77 | 4638.64 | 384.56 | 376.44 | 375.04 | 374.31 |
| T2 East | 4950.35 | 4640.46 | 386.69 | 376.93 | 375.35 | 374.43 |
| T3 West | 4334.75 | 4781.23 | 383.31 | 375.18 | 374.82 | 374.15 |
| T3 Center | 4840.94 | 4784.30 | 384.54 | 377.97 | 376.35 | DRY |
| T3 Edge | 4842.93 | 4786.07 | 383.63 | 378.27 | 376.68 | 375.18 |
| T3 East | 4847.38 | 4788.35 | 385.15 | 378.72 | 376.94 | 375.48 |

Notes: 1. Elevations are in feet, based on National Geodetic Vertical Datum of 1929.
2. MW-19S was installed on June 9, 1997.
3. MW-11 was abandonned, and MW-11R was installed on December 18, 1997.

**Table 3**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Vertical Hydraulic Gradients**

| Monitoring Well | Gradient | | |
|---|---|---|---|
| | March 1992 | August 1992 | June 1997 |
| MW-1S/1I | 0.016 | 0.04 | 0.025 |
| MW-1S/1D | 0.04 | 0.03 | 0.016 |
| MW-1I/1D | 0.11 | 0.005 | 0.004* |
| MW-2S/2I | 0.02 | 0.16 | 0.133 |
| MW-2S/2D | 0.05 | 0.08 | 0.068 |
| MW-2I/2D | 0.09 | 0.013 | 0.005 |
| MW-3S/3D | 0.13 | 0.11 | 0.0996 |
| MW-5S/5D | 0.04 | 0.02* | 0.0119 |
| MW-6S/6D | ** | ** | 0.0996 |
| MW-16S/16D | ** | ** | 0.007 |
| MW-17S/17D | ** | ** | 0.0125 |
| MW-18S/18D | ** | ** | 0.1144 |

Notes: 1. Upward flow, unless otherwise noted.
2. * - Downward flow indicated.
3. ** - Monitoring well not installed at this date.

**Table 4**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Soil Sample Analysis Summary**
**(all values are mg/kg)**

| Sample Location | SB-49 | SB-49 | SB-50 | SB-51 | SB-52 | SB-53 |
|---|---|---|---|---|---|---|
| Depth (ft) | 18 - 20 | 22 - 24 | 4 - 6 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 |
| PID Headspace (units) | 182 | 17.8 | 4.5 | -- | -- | -- |
| *VOCs* | | | | | | |
| Acetone | 14 J | 1.9 UJ | 0.015 | -- | -- | -- |
| Methylene Chloride | 6.8 UJ | 1.9 UJ | 0.002 J | -- | -- | -- |
| 1,1-Dichloroethane | 28 J | 1.2 J | 0.005 J | -- | -- | -- |
| 2-Butanone | 6.8 UJ | 1.9 UJ | 0.003 J | -- | -- | -- |
| 1,2-Dichloroethane | 1.1 J | 1.9 UJ | 0.003 J | -- | -- | -- |
| 1,1,1-Trichloroethane | 11 J | 1.9 UJ | 0.018 | -- | -- | -- |
| Trichloroethene | 280 J | 17 J | 0.019 | -- | -- | -- |
| Toluene | 27 J | 1.1 J | 0.005 J | -- | -- | -- |
| Tetrachloroethene | 6.8 UJ | 1.9 UJ | 0.011 J | -- | -- | -- |
| Ethylbenzene | 7.7 J | 0.26 J | 0.003 J | -- | -- | -- |
| Xylenes | 30 J | 1.2 J | 0.007 J | -- | -- | -- |
| *SVOCs* | | | | | | |
| 2-Methylphenol | 0.11 J | -- | 0.41 UJ | -- | -- | -- |
| 4-Methylphenol | 0.16 J | -- | 0.41 UJ | -- | -- | -- |
| Diethylphthalate | 0.46 U | -- | 0.045 J | -- | -- | -- |
| Di-n-Butylphthalate | 0.46 U | -- | 0.25 J | -- | -- | -- |
| Bis(2-ethylhexyl)Phthalate | 0.46 U | -- | 0.41 UJ | -- | -- | -- |
| *PCBs* | | | | | | |
| Arochlor 1260 | -- | -- | -- | 0.041 U | 0.23 | 0.041 U |

Notes: 1. Qualifiers are as follows:
U - Analyte not detected
J - Estimated value
-- Not analyzed
2. All detected target compounds are listed.
3. All samples were collected in February 1997.
4. mg/kg - parts per million (ppm).

**Table 5**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Groundwater Sample Analysis Summary - Organics**
**(all values are ug/l)**

| | DEEP WELLS | | | | |
|---|---|---|---|---|---|
| **Parameter** | **MW-01D** | **MW-02D** | **MW-03D** | **MW-05D** | **MW-06D** |
| ***VOCs*** | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Mar-97 |
| Vinyl Chloride | 1 U J | 1 U J | 1 U J | 1 U J | 1 U J |
| Chloroethane | 1 U J | 1 U J | 1 U J | 1 U J | 1 U J |
| 1,1-Dichloroethene | 5 J | 1 U J | 1 U J | 1 U J | 1 U J |
| Methylene Chloride | 1 U J | 1 U J | 1 U J | 1 U J | 1 U J |
| 1,1-Dichloroethane | 22 J | 1 U J | 1 U J | 1 U J | 0.9 J |
| c-1,2-Dichloroethene | 1 U J | 1 U J | 1 U J | 1 U J | 1 U J |
| 1,2-Dichloroethane | 1 U J | 1 U J | 1 U J | 1 U J | 1 U J |
| 1,1,1-Trichloroethane | 6 J | 1 U J | 1 U J | 1 U J | 1 U J |
| Trichloroethene | 1 U J | 1 U J | 1 U J | 1 U J | 1 U J |
| 4-Methyl-2-Pentanone | 5 U J | 5 U J | 5 U J | 5 U J | 5 U J |

Notes:
1. Qualifiers are as follows:
   U - Analyte not detected
   J - Estimated value
   -- - Not Analyzed
2. All detected target compounds are listed.
3. No SVOCs were detected.
4. ug/l - parts per billion (ppb).

**Table 5**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Groundwater Sample Analysis Summary - Organics**
**(all values are ug/l)**

| | SHALLOW WELLS | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **MW-03S** | **MW-07S** | **MW-08S** | **MW-10** | **MW-11** | **MW-12** | **MW-13** |
| ***VOCs*** | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Mar-97 |
| Vinyl Chloride | 1 U J | 360 J | 1 U J | 25 U | 4 | 1 U | 1 U J |
| Chloroethane | 1 U J | 50 U J | 1 U J | 25 U | 88 | 1 U | 1 U J |
| 1,1-Dichloroethene | 1 U J | 50 U J | 1 U J | 25 U | 4 | 1 U | 1 U J |
| Methylene Chloride | 1 U J | 50 U J | 1 U J | 25 U | 1 U | 1 U | 1 U J |
| 1,1-Dichloroethane | 8 J | 730 J | 1 U J | 380 | 880 | 1 U | 2 J |
| c-1,2-Dichloroethene | 7 J | 140 J | 1 U J | 150 | 47 J | 1 U | 0.8 J |
| 1,2-Dichloroethane | 1 U J | 50 U J | 1 U J | 25 U | 1 | 1 U | 1 U J |
| 1,1,1-Trichloroethane | 1 U J | 48 J | 1 U J | 25 U | 1 U | 1 U | 1 U J |
| Trichloroethene | 1 U J | 50 U J | 1 U J | 25 U | 10 | 1 U | 1 U J |
| 4-Methyl-2-Pentanone | 5 U J | 250 U J | 5 U J | 120 U | 5 U | 5 U | 5 U J |

Notes:
1. Qualifiers are as follows:
   U - Analyte not detected
   J - Estimated value
   -- - Not Analyzed
2. All detected target compounds are listed.
3. No SVOCs were detected.
4. ug/l - parts per billion (ppb).

Table 5
Former GE Court Street Building 5/5A Site
Remedial Investigation Report
Groundwater Sample Analysis Summary - Organics
(all values are ug/l)

| | SHALLOW WELLS (cont'd.) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **MW-14** | **MW-15** | **MW-16A** | **MW-16B** | **MW-17A** | **MW-17B** | |
| ***VOCs*** | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Mar-97 | Jun-97 |
| Vinyl Chloride | 1 U J | 1 U J | 390 J | 1 U J | 1 U J | 1 U J | 1 U |
| Chloroethane | 1 U J | 1 U J | 50 U J | 1 U J | 1 U J | 1 U J | 1 U |
| 1,1-Dichloroethene | 1 U J | 1 U J | 50 U J | 1 U J | 1 U J | 1 U J | 1 U |
| Methylene Chloride | 1 U J | 1 U J | 92 J | 1 U J | 1 U J | 1 U J | 1 U |
| 1,1-Dichloroethane | 1 U J | 1 U J | 590 J | 1 U J | 3 J | 1 U J | 1 U |
| c-1,2-Dichloroethene | 1 U J | 1 U J | 310 J | 1 U J | 1 U J | 1 U J | 1 U |
| 1,2-Dichloroethane | 1 U J | 1 U J | 50 U J | 1 U J | 1 U J | 1 U J | 1 U |
| 1,1,1-Trichloroethane | 1 U J | 1 U J | 50 U J | 1 U J | 1 U J | 1 U J | 1 U |
| Trichloroethene | 1 U J | 1 U J | 50 U J | 1 U J | 1 U J | 1 U J | 1 U |
| 4-Methyl-2-Pentanone | 5 U J | 5 U J | 45 J | 5 U J | 5 U J | 5 U J | 5 U |

Notes:
1. Qualifiers are as follows:
   U - Analyte not detected
   J - Estimated value
   -- - Not Analyzed
2. All detected target compounds are listed.
3. No SVOCs were detected.
4. ug/l - parts per billion (ppb).

**Table 5**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Groundwater Sample Analysis Summary - Organics**
**(all values are ug/l)**

| | SHALLOW WELLS (cont'd.) | | |
|---|---|---|---|
| **Parameter** | **MW-18A** | **MW-18B** | **MW-19S** |
| ***VOCs*** | Mar-97 | Mar-97 | Jun-97 |
| Vinyl Chloride | 10 U J | 1 U J | 1 U |
| Chloroethane | 10 U J | 1 U J | 1 U |
| 1,1-Dichloroethene | 10 U J | 1 U J | 1 U |
| Methylene Chloride | 10 U J | 1 U J | 1 U |
| 1,1-Dichloroethane | 130 J | 1 J | 1 U |
| c-1,2-Dichloroethene | 10 U J | 1 U J | 1 U |
| 1,2-Dichloroethane | 10 U J | 1 U J | 1 U |
| 1,1,1-Trichloroethane | 10 U J | 1 U J | 1 U |
| Trichloroethene | 10 U J | 1 U J | 1 U |
| 4-Methyl-2-Pentanone | 50 U J | 5 U J | 5 U |

Notes:
1. Qualifiers are as follows:
   U - Analyte not detected
   J - Estimated value
   -- - Not Analyzed
2. All detected target compounds are listed.
3. No SVOCs were detected.
4. ug/l - parts per billion (ppb).

**Table 6**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Groundwater Sample Analysis Summary - Metals**
**(all values are in ug/l)**

| Parameter | MW-07S (Total) | MW-07S (Diss.) | MW-10 (Total) | MW-10 (Diss.) | MW-11 (Total) | MW-11 (Diss.) | MW-12 (Total) | MW-12 (Diss.) |
|---|---|---|---|---|---|---|---|---|
| ***TAL Metals*** | | | | | | | | |
| Aluminum | 5560 | 71.5 B | 3660 | 80.6 B | 673 | 30.1 B | 10400 | 70.9 B |
| Antimony | 1.2 U | 1.2 U | 1.2 U | 1.2 U | 1.2 U | 1.2 U | 1.2 U | 1.2 U |
| Arsenic | 4.7 BJ | 2.7 UJ | 4.7 BJ | 4.2 BJ | 16.3 J | 3.4 BJ | 4.7 BJ | 3.3 BJ |
| Barium | 122 B | 121 B | 134 B | 279 | 44.7 B | 231 | 111 B | 142 B |
| Beryllium | 0.25 B | 0.1 U | 0.14 B | 0.1 U | 0.1 U | 0.1 U | 0.46 B | 0.14 B |
| Cadmium | 0.3 U | 0.3 U | 0.3 U | 0.3 U | 0.3 U | 0.3 U | 0.3 U | 0.3 U |
| Calcium | 155000 | 157000 | 444000 | 442000 | 165000 | 164000 | 218000 | 194000 |
| Chromium | 7.9 B | 0.6 U | 4.8 B | 0.6 U | 1.1 B | 0.6 U | 16 | 0.77 B |
| Cobalt | 2.8 B | 0.77 B | 1.3 B | 0.7 U | 0.7 U | 0.7 U | 4.7 B | 0.7 U |
| Copper | 11.7 B | 1.7 U | 5.9 B | 2.3 B | 1.7 U | 1.7 U | 12.7 B | 4.6 B |
| Iron | 9090 | 767 | 4180 | 100 | 3550 | 218 | 12500 | 84 B |
| Lead | 3 | 1.1 U | 2.4 B | 1.1 U | 1.2 B | 1.1 U | 21.8 | 1.1 U |
| Magnesium | 52500 | 52000 | 130000 | 132000 | 47300 | 46200 | 50400 | 42500 |
| Manganese | 332 | 292 | 60.5 | 39.3 | 67.9 | 50.3 | 214 | 2.9 B |
| Mercury | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 5.6 B | 2 U | 3.5 B | 2 U | 2 U | 2 U | 12 B | 2 U |
| Potassium | 2660 B | 1100 B | 5650 | 4800 B | 2670 B | 2180 B | 5330 | 2040 B |
| Selenium | 1 U | 1.3 BJ | 1.1 BJ | 1.6 BJ | 1.1 BJ | 1.5 BJ | 1 BJ | 1.6 B |
| Silver | 0.7 U | 0.75 B | 1.6 B | 1.8 B | 0.7 U | 0.71 B | 0.7 U | 0.96 B |
| Sodium | 18300 J | 21200 J | 112000 J | 115000 J | 16700 J | 17000 J | 11100 J | 13400 J |
| Thallium | 2.9 BJ | 3.7 BJ | 2.1 UJ | 2.3 BJ | 3.3 BJ | 3.3 BJ | 2.1 UJ | 3.9 BJ |
| Vanadium | 10.9 B | 0.4 U | 6.3 B | 0.68 B | 1.4 B | 0.4 U | 18.4 B | 0.4 U |
| Zinc | 22.6 | 28.5 | 14.6 B | 57.8 | 7.5 B | 71.6 | 42.6 | 48.2 |

Notes: 1. Qualifiers are as follows:
U - Analyte not detected
B - Detected below CRDL
J - Estimated value
2. All samples were collected in March 1997.
3. ug/l - parts per billion (ppb).

**Table 7**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Surface Water, Storm Sewer Outfall and Sediment Sample Analysis Summary**

## Creek and Storm Sewer Outfall Samples

| Parameter | SW-6 | OF-02 | SW-4 | OF-01 |
|---|---|---|---|---|
| *VOCs (ug/l)* | South Branch of Ley Creek Upstream | South Branch of Ley Creek Outfall | South Branch of Ley Creek Downstream | Sanders Creek Outfall |
| Vinyl Chloride | 1 U J | 2 U J | 1 U J | 87 J |
| 1,1-Dichloroethane | 1 U J | 29 J | 1 U J | 140 J |
| c-1,2-Dichloroethene | 5 J | 2 J | 4 J | 42 J |
| Chloroform | 0.8 J | 2 U J | 1 U J | 10 U J |
| 1,1,1-Trichloroethane | 1 U J | 5 J | 1 U J | 10 U J |
| Trichloroethene | 6 J | 8 J | 4 J | 10 U J |

## Sediment Samples

| Parameter | SS-2 (Up) | SS-2 (Down) | SS-1 (Up) | SS-1 (Down) |
|---|---|---|---|---|
| *VOCs (ug/kg)* | South Branch of Ley Creek Outfall Area | | Sanders Creek Outfall Area | |
| Chloroethane | 11 J | 21 J | 13 U J | 14 U J |
| Acetone | 13 U J | 4 J | 2 J | 14 U J |
| 1,1-Dichloroethene | 13 U J | 2 J | 13 U J | 14 U J |
| Methylene Chloride | 2 J | 4 J | 2 J | 3 J |
| Carbon Disulfide | 13 U J | 3 J | 13 U J | 14 U J |
| 1,1-Dichloroethane | 10 J | 22 J | 13 U J | 14 U J |
| 1,2-Dichloroethene | 13 U J | 19 J | 2 J | 14 U J |
| Trichloroethene | 13 U J | 22 J | 6 J | 2 J |
| ***Total Organic Carbon (%)*** | -- | 2.2 | -- | 2.73 |

Notes: 1. Qualifiers are as follows:
U - Analyte not detected
J - Estimated value
-- - Not Analyzed
2. All detected target compounds are listed.
3. All samples were collected in March 1997.
4. ug/l - parts per billion (ppb) liquid.
5. ug/kg - parts per billion (ppb) dry weight.

**Table 8**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Plant Species**

| Herbaceous Plants | |
|---|---|
| Spotted Knapweed | *Centaurea maculosa* |
| Teasel | *Dipsacus sylvestris* |
| Timothy | *Phleum pratense* |
| Queen Anne's Lace | *Daucus carota* |
| Horsetail | *Equisetum* spp. |
| Goldenrod | *Solidago* spp. |
| Wild Cucumber | *Echinocystis lobata* |
| Thistle, Canada | *Cirsium arvense* |
| Smartweed | *Polygonum pensylvanicum* |
| Purple Loosestrife | *Lythrum salicaria* |
| Dogbane | *Apocyhum androsaemifolium* |
| Milkweed | *Asclepias syriaca* |
| Honeysuckle | *Lonicera* spp. |
| Virginia Creeper | *Parthenocissus quinquefolia* |
| Wild Cucumber | *Enchinocystis lobata* |
| Bind Weed | *Convolvulus sepium* |
| Jewel Weed | *Impatiens capensis* |
| Cattail | *Typha latifolia* |
| Phragmites | *Phragmites communis* |
| Beggers Tick | *Bidens* spp. |
| Nightshade | *Solanum dulcamara* |
| Catalpa | *Catalpa speciosa* |
| Box Elder | *Acer negundo* |
| False Bamboo | *Polygonum cuspidatum* |
| Black Willow | *Salix nigra* |
| Eastern Cottonwood | *Populus tremuloides* |
| Sugar Maple | *Acer saccharum* |
| Grape | *Vitis* spp. |
| Northern False Foxglove | *Aureolaria flava* |
| Staghorn Sumac | *Rhus typhina* |
| Spanish Needles | *Bidens* spp. |
| Poison Ivy | *Toxicodendron radicens* |
| Silky Dogwood | *Cornus amomum* |
| Slippery Elm | *Ulmus rubra* |

**Table 9**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Wildlife Species**

| **Mammals** | |
|---|---|
| Woodchuck | *Marmota monox* |
| Raccoon | *Procyon lotor* |
| Muskrat | *Ondatra zibethicus* |
| Gray Squirrel | *Sciurus carolinensis* |

| **Avian Species** | |
|---|---|
| Mallard | *Anas platyphynchos* |
| Grackle | *Quiscalus quiscula* |
| Robin | *Turdus migratorius* |
| Crow | *Corvus brachyrhynchos* |
| Starling | *Sturus vulgaris* |
| Least Flycatcher | *Empidonax minimus* |
| Sparrow | *Spizella* spp. |
| Carolina Wren | *Thyrothorus ludovicianus* |
| Canada Warbler | *Wilsonia canadensis* |
| Green Heron | *Butorides virescens* |
| Cardinal | *Richmondena cardinalis* |
| Kingfisher | *Megaceryle alcyon* |
| Killdeer | *Charadrius vociferus* |
| American Goldfinch | *Spinus tristis* |
| Swallow, Rough Winged | *Stelgidopteryx ruficollis* |

| **Reptiles** | |
|---|---|
| Garter Snake | *Thamnophis sirtalis* |

**Table 10**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Summary of Human Health Exposure Pathways**

| Medium | Potential Exposure Routes | Complete at Site | |
|---|---|---|---|
| | | Present | Potential Future |
| Groundwater | Consumption (water supply) | No | No |
| | Inhalation from indoor air (water supply) | No | No |
| | Dermal contact (incidental) | No | Yes[1] |
| | Dermal contact (water supply) | No | No |
| | Consumption of contaminated produce | No | No |
| | Inhalation of VOCs | No | Yes[1] |
| Surface Water | Incidental ingestion | No | Yes[2] |
| | Dermal contact | No | Yes[2] |
| | Inhalation of VOCs | No | Yes[2] |
| | Consumption of fish (bioaccumulation) | No | No |
| Sediment | Incidental ingestion | No | Yes[2] |
| | Dermal contact | No | Yes[2] |
| | Consumption of fish (bioaccumulation) | No | No |

Notes:

[1] Occupational exposure only.

[2] De minimis.

**Table 11**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Summary of Complete Ecological Exposure Pathways**

| Medium | Receptors | Potential Exposure Routes |
|---|---|---|
| Groundwater | Terrestrial Animals | Inhalation of VOCs (de minimis) |
| Surface Water | Terrestrial Animals | Inhalation of VOCs<br>Consumption (drinking water)<br>Incidental ingestion<br>Dermal absorption<br>Consumption of aquatic life (bioaccumulation) |
| | Aquatic Animals | Direct contact (use as habitat)<br>Consumption of aquatic life (bioaccumulation) |
| Sediment | Terrestrial Animals | Incidental ingestion<br>Consumption of aquatic life (bioaccumulation) |
| | Aquatic Animals | Direct contact (use as habitat)<br>Consumption of aquatic life (bioaccumulation) |

**Table 12**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Summary of Surface Water Screening Values for Contaminants of Concern**

| | Maximum Observed at Site (ug/l) | | NYS Surface Water Standard[1] | USEPA AWQC[3] (ug/l) | USDOE PRG[7] (ug/l) | USEPA Ecotox Threshold[10] (ug/l) | Lowest Screening Value (ug/l) |
|---|---|---|---|---|---|---|---|
| | Outfall | Creek | | | | | |
| **Contaminant of Concern** | | | | | | | |
| 1,1-Dichloroethane | 140 | ND | NA | 20,000[4,5] | 47 | 47 | 47 |
| 1,2-cis-Dichloroethene | 42 | 4 | NA | NA[6] | 590[8] | NA | 590 |
| 1,1,1-Trichloroethane | 5 | ND | NA | 18,000[4] | 11 | 62 | 11 |
| Trichloroethene | 8 | 4 | NA[2] | 21,900[4] | 470 | 350 | 350 |
| Vinyl chloride | 87 | ND | NA | NA | 782[9] | NA | 782 |

Notes:

ND - Not detected.

NA - Not available.

ug/l - parts per billion (ppb).

[1] NYCRR Part 703; for Class C surface waters.

[2] There is a guidance value; but it is based on protection of human health, not of aquatic life, so it is not relevant for ecological screening.

[3] Ambient water quality criterion for protection of freshwater life from chronic effects.

[4] Lowest value at (value as low as) which toxicity occurs.

[5] Value is for 1,2- isomer; however, toxicity is a function of degree of chlorination, so value for 1,1- isomer is estimated to be on the same order of magnitude.

[6] No data on chronic toxicity; acute toxicity occurs at concentrations as low as 11,600 ug/l.

[7] US Department of Energy preliminary remediation goal; all values except vinyl chloride are secondary chronic values.

[8] Value for dichloroethenes.

[9] Based on protection of piscivorores using the river otter lowest observed adverse effects level (LOAEL).

[10] EPA 540/F-95/038.

**Table 13**
**Former GE Court Street Building 5/5A Site**
**Remedial Investigation Report**
**Summary of Sediment Screening Values for Contaminants of Concern**

| Contaminant of Concern | Maximum Observed at Site (ug/kg) | NYS Sediment Guidance Screening Value[1] (ug/kg) | USDOE PRG[2] (ug/kg) | USEPA Ecotox Threshold[3] (ug/kg) | Lowest Screening Value (ug/kg) |
|---|---|---|---|---|---|
| 1,1-Dichloroethane | 22 | NA | 27 | NA | 27 |
| 1,1-Dichloroethene | 2 | NA | 3500 | NA | 3500 |
| 1,2-Dichloroethene | 19 | NA | 400 | NA | 400 |
| Methylene chloride | 4 | NA | 18,000 | NA | 18,000 |
| Trichloroethene | 22 | NA | 52,000 | 4100 | 4100 |

Notes:

ND - Not detected.

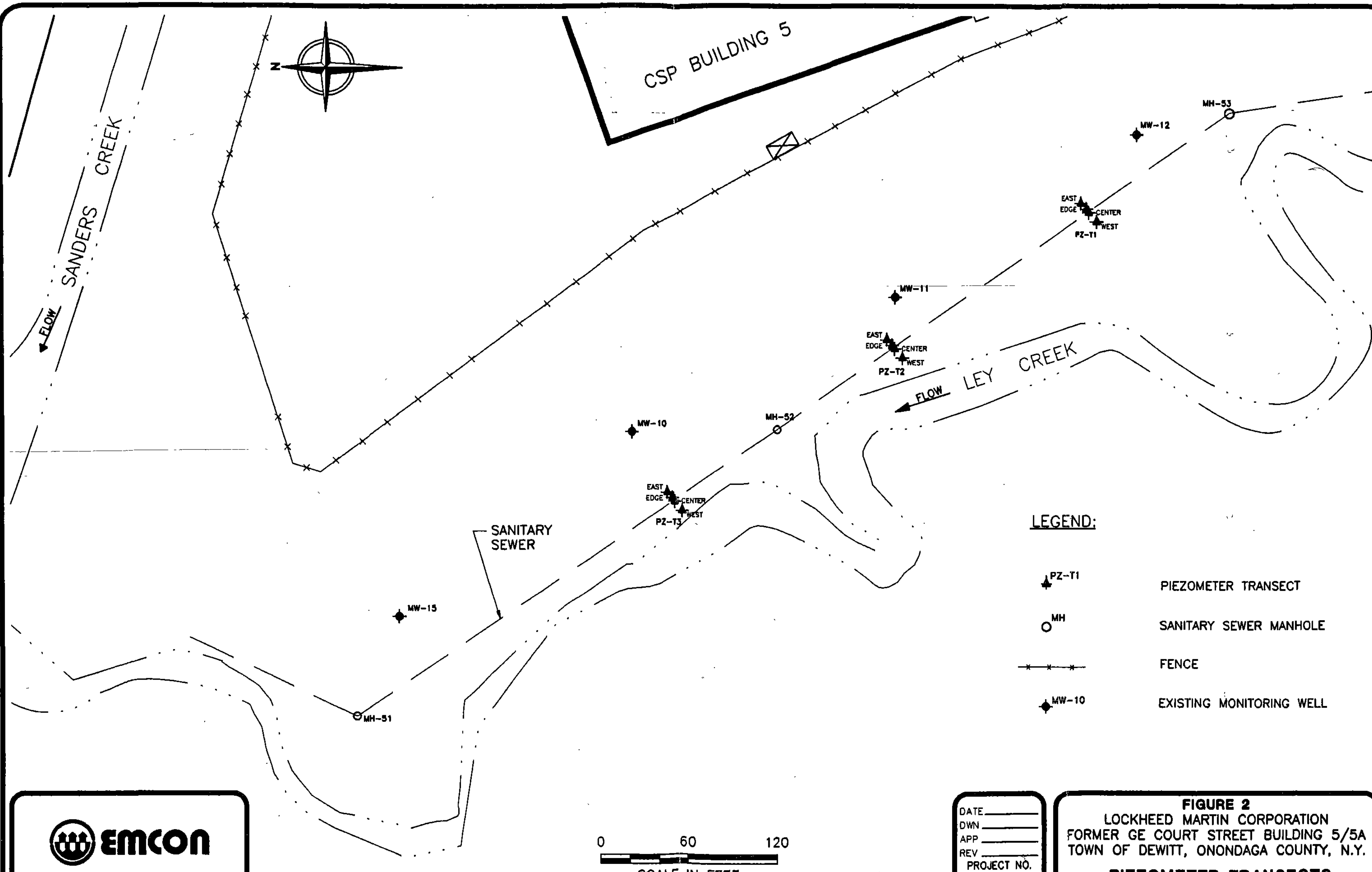
NA - Not available.

ug/kg - parts per billion (ppb).

[1] Based on protection of freshwater benthic aquatic life from chronic effects.

[2] US Department of Energy preliminary remediation goal; values are lowest or secondary chronic values.

[3] Based on equilibrium partitioning assuming an average organic carbon content of 2.5%.



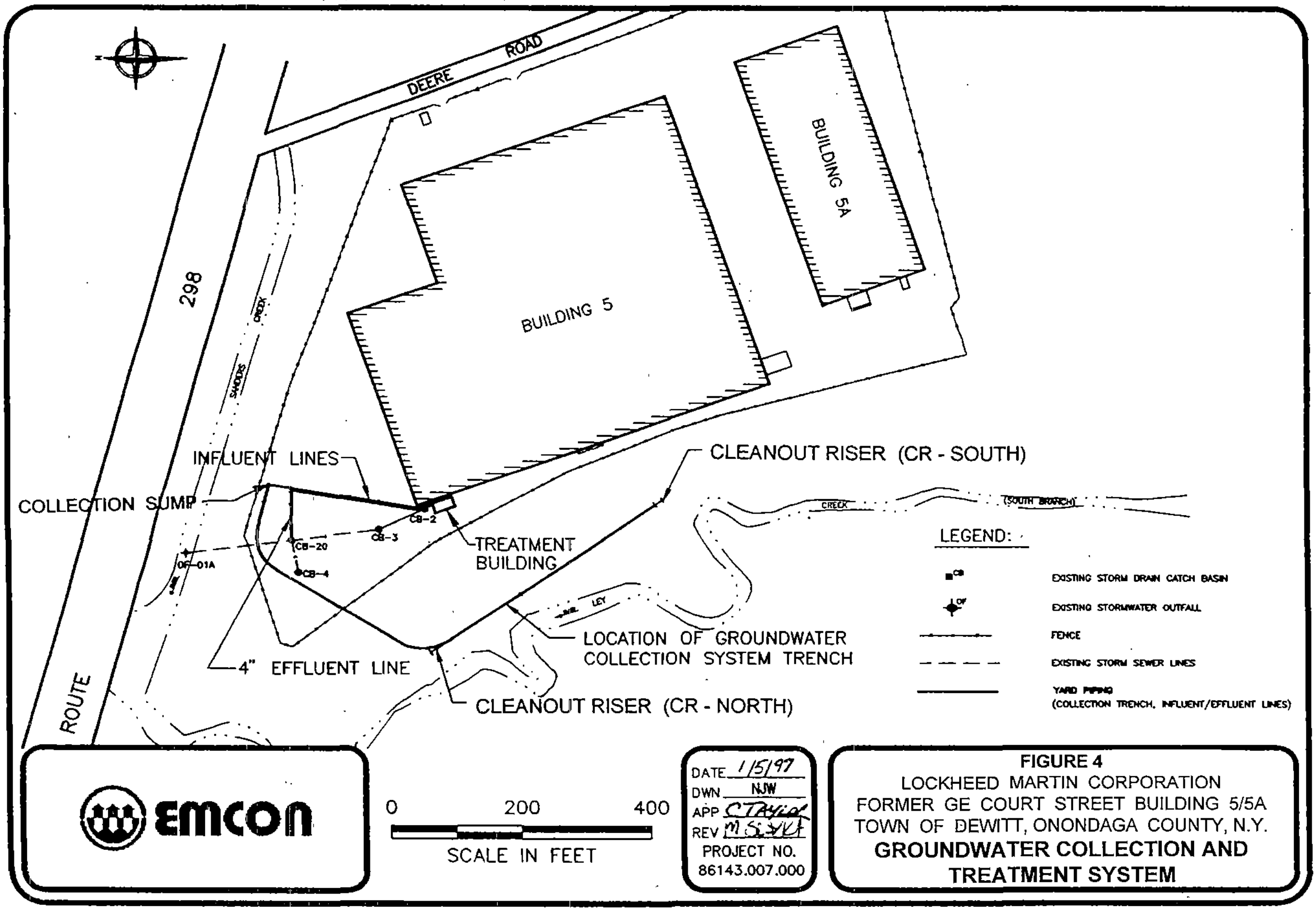

EMCON

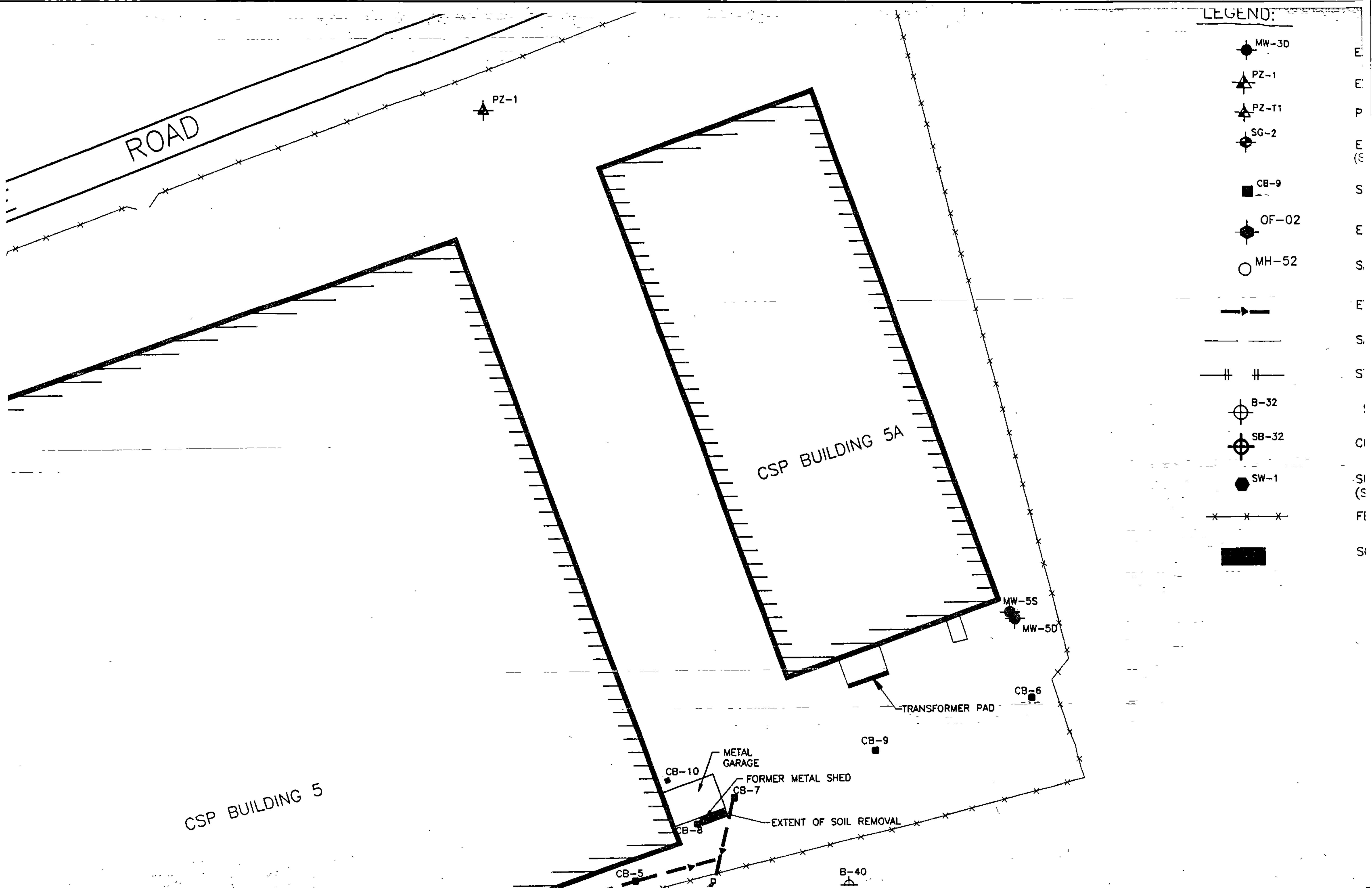
DATE
DWN
APP
REV
PROJECT NO.
86143-001.000

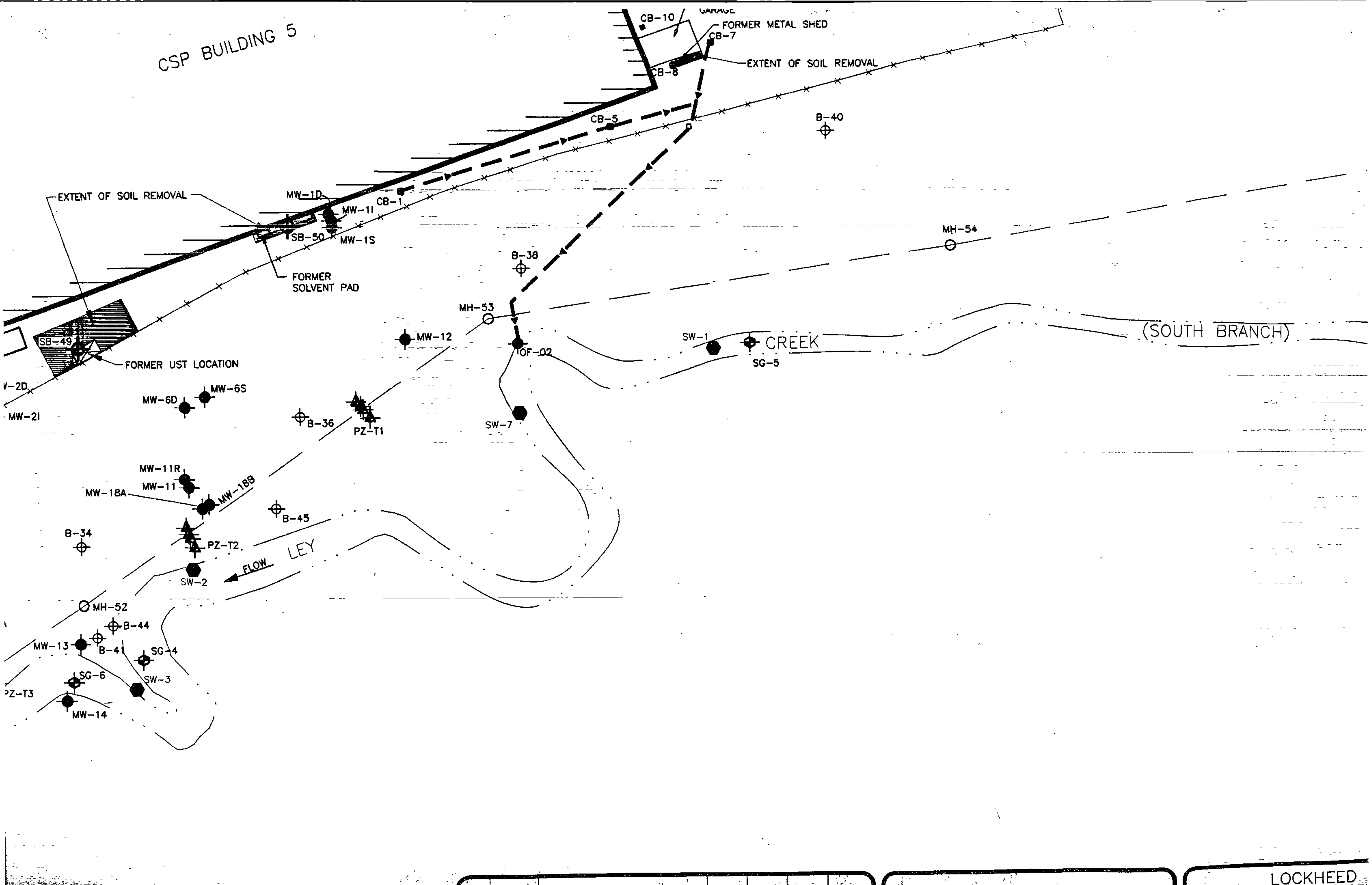
**FIGURE 2**
LOCKHEED MARTIN CORPORATION
FORMER GE COURT STREET BUILDING 5/5A
TOWN OF DEWITT, ONONDAGA COUNTY, N.Y.

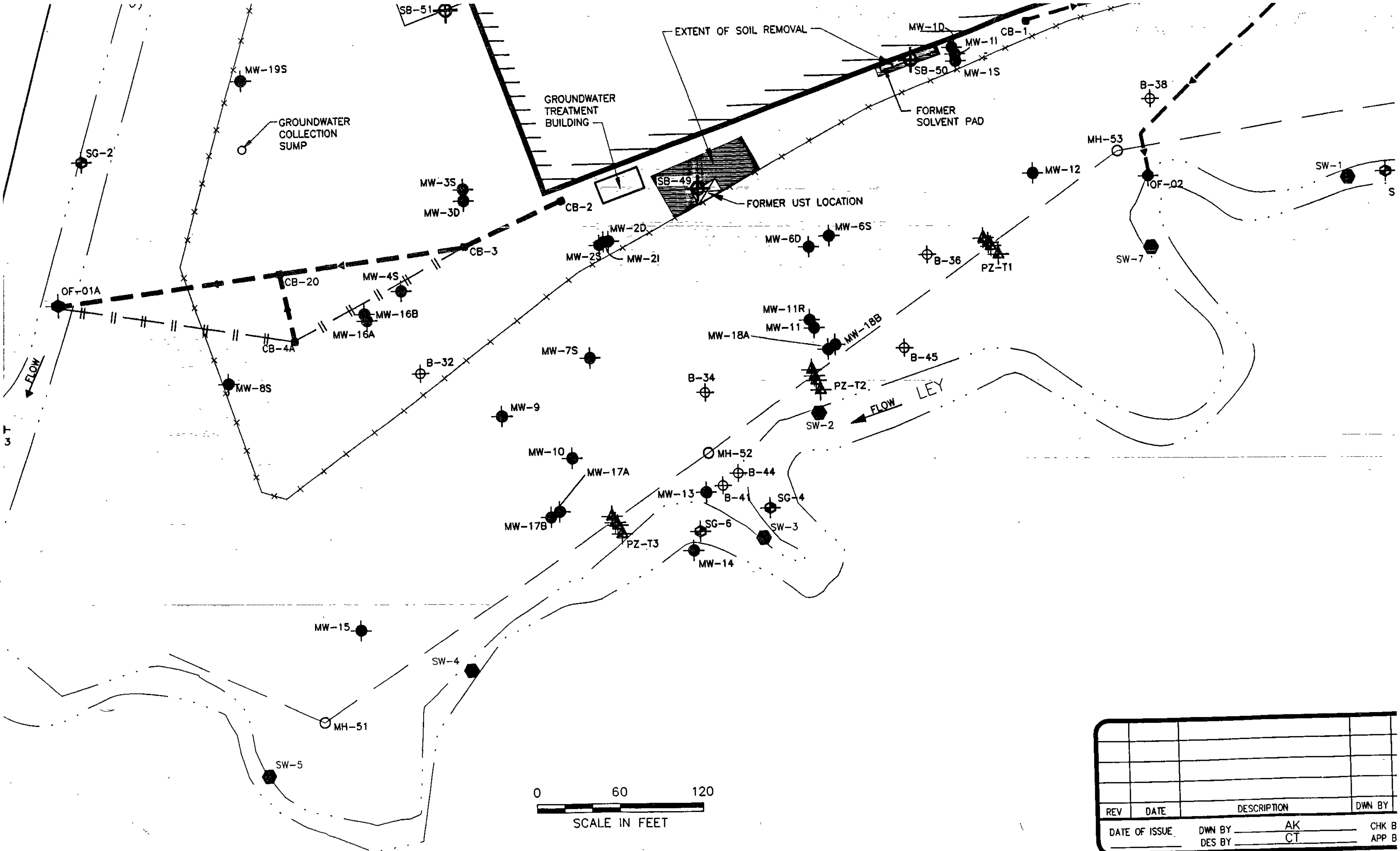
**PIEZOMETER TRANSECTS**

ENE-ANDVR2/DATA: N:\DWG\86143003\000\ANDO-07.dwg Xrefs: <NONE>
Scale: 1 = 1.00 DimScale: 1 = 60.00 Date: 12/30/97 Time: 10:32 AM Operator: ACADTWO




ROAD
PZ-1
CSP BUILDING 5A
CSP BUILDING 5
MW-5S
MW-5D
TRANSFORMER PAD
CB-6
CB-9
METAL GARAGE
CB-10
FORMER METAL SHED
CB-7
EXTENT OF SOIL REMOVAL
CB-8
CB-5
B-40
LEGEND:
MW-3D
PZ-1
PZ-T1
SG-2
CB-9
OF-02
MH-52
B-32
SB-32
SW-1


CSP BUILDING 5
GARAGE
CB-10
FORMER METAL SHED
CB-7
EXTENT OF SOIL REMOVAL
CB-8
CB-5
B-40
EXTENT OF SOIL REMOVAL
MW-1D
MW-1I
CB-1
SB-50
MW-1S
FORMER SOLVENT PAD
MH-54
B-38
MH-53
SB-49
FORMER UST LOCATION
MW-12
SW-1
CREEK
(SOUTH BRANCH)
SG-5
OF-02
MW-2D
MW-6S
MW-6D
MW-2I
B-36
PZ-T1
SW-7
MW-11R
MW-11
MW-18B
MW-18A
B-45
B-34
PZ-T2
LEY
FLOW
SW-2
MH-52
B-44
MW-13
B-41
SG-4
SG-6
SW-3
PZ-T3
MW-14
LOCKHEED




| REV | DATE | DESCRIPTION | DWN BY |
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DATE OF ISSUE
DWN BY AK
DES BY CT
CHK B
APP B